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ABSTRACT

A follow-up to the 1979 report, Using Instructional Media beyond Campus, this report describes a plan for making statewide use of available media for postsecondary education in California. The first of three sections provides a basic inventory of California's telecommunications resources, focusing on electronic means of transmitting information over long distances and time, e.g., television, radio, and telephone. The second section identifies five areas of knowledge as major social needs, including basic adult competencies or survival skills, and employment information and occupational skills, and discusses how these needs can be met on a statewide basis with electronic media. Primary barriers hindering the use of these resources by postsecondary institutions are identified as lack of incentives and coordination and high initial costs, and recommended steps for marshalling the necessary resources to meet the state's educational needs are described in the final chapter. The four appendices include a summary and findings of the first report on telecommunications issued by the commission, a reference list on major societal needs, and catalogs of taped instructional materials for postsecondary use. Six maps, three tables, and two figures illustrating typical cost patterns per student for classroom-intensive courses and technology-intensive telecourses are provided, as well as 19 references and an index. (RBF)

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LINKING CALIFORNIANS FOR LEARNING

Next Steps for Telecommunications in California Postsecondary Education

A Report from the California Postsecondary Education Commission

IR010114

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PREFACE

In 1979, the California Postsecondary Education Commission issued its first report on telecommunications, Using Instructional Media Beyond Campus. In that report, the Commission noted that California had no plan for developing, on a statewide and cooperative basis, its many telecommunications resources for facilitating learning past the high school years. 1/

The Commission found that relatively small amounts of support, planning, and State-level coordination would be needed for the three public segments of higher education to develop effective and efficient vehicles for extensive education beyond the campus, but budgetary incentives did not exist for this effort. "There is no official process or mechanism for intersegmental, statewide planning, coordinating, developing, and using of remote mediated instruction in California," it found. It stated further that "an important first step toward more concerted, statewide use of available media for postsecondary instruction--especially beyond campus--could be taken by the California Postsecondary Education Commission's convening an intersegmental planning task force of experts . . . ." 2/ (Appendix A reproduces the summary and findings from that report.)

In November 1979, the Commission appointed a technical advisory committee of some two dozen experts in telecommunications and education to assist in drafting a plan for statewide development and use of telecommunications for postsecondary education. (Appendix B lists its members.)

This advisory committee, chaired by Dale M. Heckman of the Commission staff, brought together a great deal of information in a brief time, its members even contributing portions of the first draft of this report. In addition, Mrs. Kiki Skagen Munshi undertook, under a short-term contract, the gathering of additional facts for the inventory of resources reported in Chapter One. The Commission is grateful to the members of the committee and to their sponsoring agencies and institutions, as well as to the State agencies listed in Table 2 that responded to the Commission's request for information about their use of telecommunications for public or staff instruction. While acknowledging the substantial contribution of all these individuals and groups, the Commission has reached its own conclusions and the recommendations it offers in this report.

The Commission regards the current report as a second phase of planning rather than a completed plan. Telecommunications is a complex and fast changing field, and few would claim to see its whole panorama.

By "telecommunications," the Commission means electronic methods of transmitting information over long distances or time (as with recorded signals). Thus this report focuses on television, radio, telephone, and related media, rather than on such print media as newspapers and magazines. It emphasizes the off-campus potential of electronic media rather than on-campus uses (such as computers or TV monitors in a university classroom), because of the particular advantages of telecommunication technology for learning at a distance.

Probably every new form of technology brings with it some potential for abuse or misuse. The Commission recognizes this potential with regard to the electronic means now available for communicating between teacher and student. Furthermore, the Commission does not foresee the displacement of campuses or classrooms by these media--for example, computer terminals or TV screens. Yet in view of widespread and growing acceptance of telecommunicating for learning by California institutions and individuals, it is timely to inquire how to enhance the benefit for the public from the diverse capabilities for telecommunicating that are available for public education and information.

This is not merely a matter of new gadgets in search of good uses. California has some costly social problems that education can help resolve--with wider outreach or additional ways of informing and teaching. The new media bear a close analogy, in this regard, to the printed textbook. Depending on who uses it and in what ways, the textbook often turns out to be a useful, timesaving medium for educational communication. Yet few would claim that it can perform all the functions of teaching. It simply is a medium of communication between teachers and learners; it requires selective, skillful and critical use as well as the integrity of those who collaborate in its production.

Chapter One of the report provides a basic inventory of California's manifold resources in telecommunications that can be used for learning beyond high school. Chapter Two then identifies five major public needs involving education and illustrates how these needs can be met on a statewide basis in California with one or another type of electronic media. Finally, Chapter Three notes the primary barriers hindering the use of these resources by postsecondary institutions and recommends steps for marshalling these resources to meet the State's educational needs.

1 PRESENT PROGRESS IN EDUCATIONAL TELECOMMUNICATIONS

California has a wealth of telecommunications technology which it can marshal in conjunction with its renowned colleges and universities to deal with persistent and costly social needs.

- Major social problems requiring widespread education can be addressed more effectively if telecommunications supplement traditional means of instruction.

- Teachers and learners can now overcome the barriers of time and distance in communicating with each other electronically, and learning at a distance can help conserve badly needed energy resources such as gasoline.

Not all public colleges and universities should be expected to adapt telecommunications technology for their assigned missions, but as they consider using it, they should be encouraged to plan its use cooperatively from a statewide rather than solely a local perspective.

TELECOMMUNICATIONS AVAILABLE FOR POSTSECONDARY EDUCATION

Various means for communicating at a distance or over time electronically are now in common use by people throughout California:

- Ninety-seven percent of the adults in the State have telephone service.

- More than 95 percent are within reach of public radio.

- More than 90 percent are within reach of public television.

- More than 2 million subscribers are now connected to a cable television system--and "subscriber" often means more than one person.

- Hundreds of institutions, including most public colleges and many public libraries, have equipment for viewing instructional videotapes.

- Hundreds of thousands of Californians have audiocassette players that they can use for instruction, many even while commuting to and from work.

But among California's telecommunication resources, which ones are now used for postsecondary education? What organizations have the experience or readiness for using different media? And what are the strengths and limitations of each medium for learning?

The following pages seek to answer these questions for each of the major types of media, beginning with those that transmit moving visual information, such as broadcast and cable television and videotapes; then reviewing those that transmit graphic or printed information, such as computers and electronic blackboards; and concluding with those that are limited to audio information, such as telephone and radio, and that carry signals for these other systems, including communication satellites and microwave systems.

BROADCAST TELEVISION

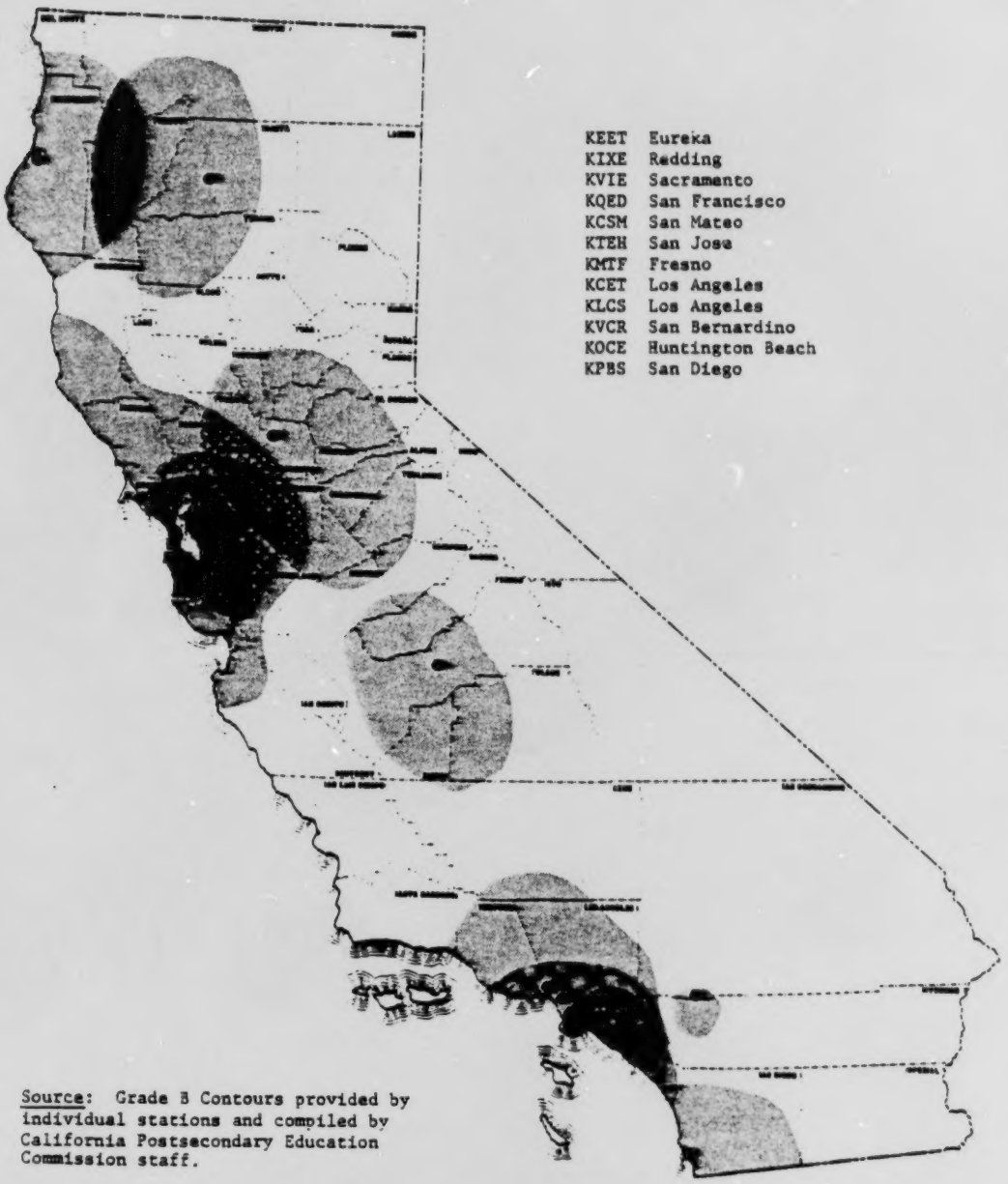
The moving image and accompanying audio of television are at present the most widely used type of telecommunication in California for postsecondary instruction beyond the campus. Both public and commercial broadcast stations carry programs used in postsecondary instruction, and a large majority of California's accredited colleges and universities make use of these broadcasts. There are twelve public television stations in California (identified in Map A), most of which are owned by educational organizations. They reach over four million viewers each week; their broadcast areas are greatly extended by cable system delivery; and they account for approximately three-fifths of all the air time used for postsecondary instruction in California--with the other two-fifths being donated as a public service by some seventeen commercial stations that cover an even wider expanse (listed in Map B).

Examples of Instructional Uses of Broadcast Television

Telecourses: The broadcast "telecourse" is probably the best-tested and the most widely used telecommunications medium for education since California turned to radio to disperse agricultural information to farmers. A typical telecourse, such as the recent "A Time to Grow," on human development, may consist of as many as forty-five television programs (or "modules") of 30 minutes each, which are carefully coordinated with a textbook, a study guide with assignments, and support from the local college. Each college offering the course provides an "instructor of record" whom students can contact in person or by telephone and who conducts review sessions and examinations; and the college awards units of lower division credit for successful completion of the course. Recently, thirty-seven colleges in Southern California offered "A Time to Grow," with each program broadcast twice throughout the area. No one knows how many people watched these broadcasts, but over 5,400

MAP A

APPROXIMATE BROADCAST AREAS OF
PUBLIC TELEVISION STATIONS IN CALIFORNIA



Source: Grade B Contours provided by individual stations and compiled by California Postsecondary Education Commission staff.

MAP B

APPROXIMATE BROADCAST AREAS OF COMMERCIAL TELEVISION STATIONS IN CALIFORNIA
WHICH HAVE AIRED COLLEGE OR UNIVERSITY INSTRUCTION FOR CREDIT

KRCR	Redding
KHSL	Chico
KCRA	Sacramento
KOVR	Stockton
KTVU	Oakland
KGO	San Francisco
KPIX	San Francisco
KRON	San Francisco
KAIL	Fresno
KFSN	Fresno
KMJ	Fresno
KABC	Los Angeles
KHJ	Los Angeles
KNXT	Los Angeles
KTTV	Los Angeles
KCST	San Diego
KGTV	San Diego

Source: Grade B Contours provided by individual stations and compiled by California Postsecondary Education Commission staff.

enrolled for college credit in the course. Television network officials estimate that between ten and twenty viewers watch a telecourse for every one who enrolls, buys the materials, or takes the exams.

Over eighty of California's 100 community colleges regularly provide academic credit and support for broadcast telecourses. They are grouped into five regional consortia for cost-sharing in leasing, promoting, airing, and, in some cases, producing and marketing telecourses:

Bay Area Community College TV Consortium (San Francisco area)
Central Valley ITV Consortium (Fresno area)
Committee on Instructional Telecommunications (San Diego area)
Southern California Consortium for Community College TV (Los Angeles area)
Television Consortium of Valley Colleges (Sacramento area)

The Southern California Consortium for Community College Television, largest of the five, is comprised of thirty-three member colleges in the Greater Los Angeles area. It arranges for the broadcast of telecourses, provides support services to member colleges and students, and produces telecourses that are used widely throughout the United States. In the Fall of 1980, it aired nine telecourses, which had a combined enrollment of from 12,000 to 15,000 Southern Californians. It plans to offer more than thirty courses during the 1981-82 academic year.

Among individual institutions, Coastline Community College in Orange County offers the largest television-based instructional program in California. Approximately 4,400 students register in an average of sixteen telecourses each semester. These enrollments constitute 20 percent of the College's total enrollment. The Coast Community College District is one of the nation's foremost developers of college telecourse materials. Working with its own public television station, KOCE-TV, and other educational institutions, the district has created some seventeen telecourses and made them available to colleges throughout the country by lease and purchase arrangements. Some 800 colleges and universities have used them.

Another public television station in California, KCSM-TV, is run by the San Mateo County Community College District. It has had long experience in providing not only telecourses for college credit but also educational and information programming for disadvantaged adults in its community. It recently expanded its broadcast area to cover much of the San Francisco Bay region; in Fall 1981 it will air more than twenty courses, including those offered nationwide through the new "PTV-3" system of the Public Broadcasting Service.

"Wrap-Around" Courses: The "wrap around" is a variant of the planned telecourse. Before the TV series, "The Adams Chronicles," was to be aired for the Bicentennial, several alert California educators arranged to create and publish support materials with which to make formal educational use of the broadcasts. Thus the course was put together after the TV programs but in time to wrap around them the needed support materials and advance information for educators.

University Extension at the University of California, San Diego, is nationally known for its development of wrap-around telecourse materials, including those for "The Ascent of Man" and "The Shakespeare Plays." UCSD Extension collaborates with the TV producer and publishers to develop materials used by college students across the nation. Its telecourses were the basis for a recent two-year research project that examined their economics and administration. The extension and continuing education divisions of up to twenty institutions within the University of California and the California State University and Colleges frequently offer support and extension credit for these and other courses with broadcast TV components.

The National University Consortium: Several California institutions are trying out a consortial arrangement with the University of Maryland called "The National University Consortium," with the aim of adapting the courses of the British Open University to American requirements. These courses combine large reading assignments with occasional audio materials, tutoring sessions, and broadcast of a ninety-minute television program or module every other week. California State University, Dominguez Hills, offered several upper division courses based on the British Open University model during the Fall of 1980, and currently two public broadcast stations in California--KCET-TV in Los Angeles and KQED-TV in San Francisco--are scheduling the Maryland-produced programs on a pilot basis. The University of San Francisco is sponsoring these courses in the Bay Area.

Other Educational Uses of Television: Among additional illustrations of instruction through broadcast television are these:

- San Diego State University is the site of KPBS, the only public broadcast TV station owned by the Trustees of the California State University and Colleges. KPBS is widely regarded for the quality and diversity of its educational efforts; increasingly it considers itself a "telecommunications center" rather than solely a broadcast station.

- Some public libraries in California host groups of viewers, such as parents of young children, who convene to watch a broadcast program and then remain for seminar discussion.

- A number of California State agencies use broadcast television for public information. Among them, the Commission on Aging employs spot announcements to inform senior citizens about services for them. The California Conservation Corps uses public service spots for recruitment and public understanding. The Consumer Services Division of the Consumer Affairs Department uses these spots for information "tips" to the general public. The Department of Food and Agriculture employs them as well as television programs for bulletins, announcements, and instruction. The Department of Forestry seeks to prevent forest fires; the Franchise Tax Board reminds taxpayers of tax regulations; the Secretary of State offers instruction and encouragement on registering to vote and voting; and the Department of Transportation provides safety and traffic information by means of them.

Features of Broadcast Television Significant for Education

Among the characteristics of broadcast TV that bear significantly on its potential for learning, these seem particularly important:

Audience Involvement: Television enables the viewing of any photographed or videotaped activities, including historic one-time events, remote places, microscopic phenomena, and even theoretical constructs, such as the birth of a star. Potential audience is vast, second only to that for radio, and includes the homebound and institutionalized with access to TV reception.

Fixed Schedules: Unless viewers have videotape recorders, they must watch the programs when broadcast or else view tapes on playback equipment at a learning center. The broadcast schedule helps set the pace of using printed materials.

Limited Air Time: Because of limited frequencies available to broadcasters and the economics of the industry, air time is severely limited by the demand for non-instructional programming.

One-Way Communication: Broadcasting is essentially one-way transmission: there is no opportunity for immediate dialog or questioning. (Thus no formal instruction using broadcast television depends solely on it for learning.)

High Initial Cost: The cost of producing television programs of a technical quality acceptable for broadcast begins in the tens of thousands of dollars and ranges up into the hundreds of thousands before the first use. From that moment, however, multiple ways exist to reuse the program. Thus most institutions lease and adapt, but do not produce, instructional modules for broadcasting.

Variety of Spin-Offs: Whatever can be offered once by broadcast television can be taped, repeated, distributed to learning centers for replay without limit, altered (such as being captioned for the hearing-impaired), and even improved by further testing and review.

CABLE TELEVISION

In 1979, the Legislature passed a landmark bill (AB 699-Young) regarding the community franchising of cable television systems. Currently, about eighty companies hold franchises from California cities or counties to operate cable television service through some 290 different cable systems in 800 communities (see Map C). Almost every locality by now has become involved in devising a cable franchise. In 1980, California's approximately two million subscribers paid an average of $8 per month for cable reception.

"Cable" usually refers to cable television, although almost any type of message can be transmitted by cable, and many separate electronic signals can be transmitted along the cable. It is becoming common for a cable company to offer fifty or more channels; a single channel can carry several FM signals at once in the "space" a moving video signal would require. Cable systems typically carry local broadcast station signals as well as programming from other sources such as satellite transmissions and special locally generated "community service" programs over their many channels. Neither mountains, helicopters, atmospheric conditions, or electrical rotors disturb the cable signal. Because of these facts, relaxation of governmental constraints during the 1970s and the growing variety of programming available by cable, commercial cable television recently has become the most aggressively expanding medium of telecommunications.

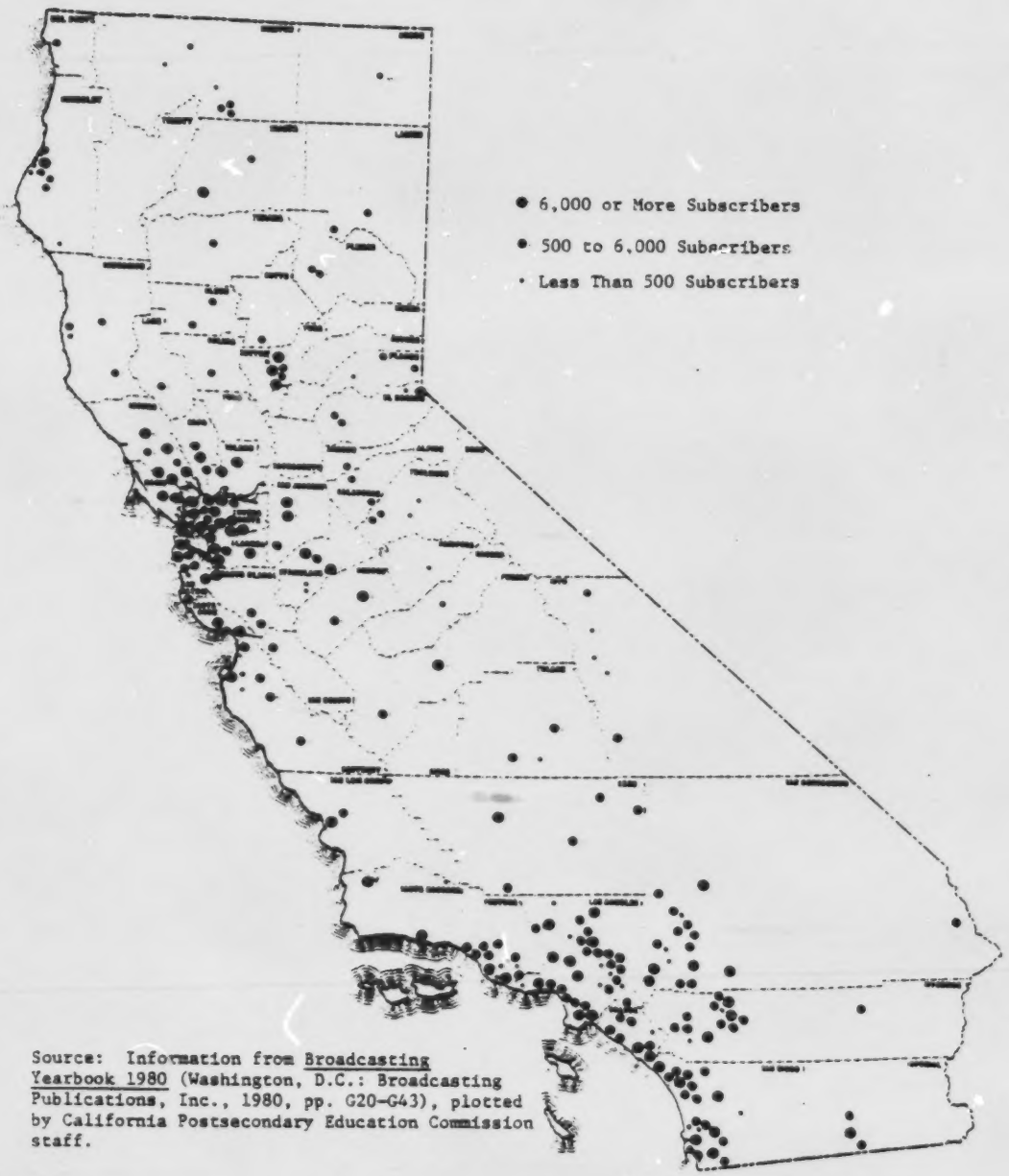
Examples of Instructional Uses of Cable Television

Modesto Junior College operates one channel of the cable television system in its area. It also has an "earth station" parabolic receiver (or "down-link") to receive instructional television programs via earth satellite, such as those transmitted by the Appalachian Community Service Network on the east coast. In the Spring of 1981, 150 students earned credit from the college in two courses for which most of the instructional presentations originated east of the Rockies. Some 24,000 cable subscribers watch MJC's cable programs in the Modesto area.

San Diego T.V. College, a division of the San Diego Community College District, has made regular use of cable systems for several years in distributing its telecourse programs to a far wider audience than it could reach by broadcast alone. (One cable system in San Diego has the largest number of subscribers of any in the United States.)

MAP C

CABLE TELEVISION SYSTEMS FRANCHISED IN CALIFORNIA, 1980



Source: Information from Broadcasting Yearbook 1980 (Washington, D.C.: Broadcasting Publications, Inc., 1980, pp. G20-G43), plotted by California Postsecondary Education Commission staff.

In a unique project begun with federal funds provided through the Commission and conducted by several cooperating institutions in San Diego, "Public Access Cablevision by and for Elders" ("PACE") trains older adults in video production, produces videotapes for older adults, and then cablecasts these and other programs throughout the area. For anyone not subscribing to cable service in San Diego, PACE has several viewing centers for playing its videotapes. A similar user-controlled channel has been proposed for ethnic groups in the area.

The Irvine Unified School District has run a two-way cable communication system since 1973 that links eighteen elementary and secondary schools, the University of California at Irvine, City Hall, and the local library. The school district has leased two channels from Community Cablevision for this system, and transmits three to five hours of programming daily. Each school can originate programs and transmit them to another school or group of institutions for student instruction, one-to-one interaction among students and teachers, or administrative purposes. By means of a third access channel, cable subscribers can watch school programs at home, such as a weekly program for adults on health. If they wish, they can respond by telephone. 3/

At the University of Southern California, Broadcast Production and Media Services has aired telecourses and educational programs via cable since 1978 and has made each series available to cablecasters via license agreements.

Several public libraries in California have production capability for cable programming and at least one has housed a "head end" for a cable channel, where programming can enter the local distribution system. One public library has even operated a cable channel.

The first joint venture in California between public television broadcasters and cable companies occurred on July 20, 1980, when KQED-TV in San Francisco sponsored a two-hour live "satellite conference" on energy. The program originated from Sacramento and San Diego as well as San Francisco, and allowed cable subscribers an opportunity to question State policy makers, utility company representatives, and consumer spokespersons.

Features of Cable Television Significant for Education

Three special qualities of cable affect the use of cable television for learning:

Multiple Channels: Because of the much greater number of channels available through cable than broadcast, more time is potentially available for instructional use, and lower technical quality can be tolerated than for general broadcast.

Limits on Audience: Cable is neither available to nor received by everyone. Some neighborhoods and districts have not yet chosen to "wire up," and residents where cable lines exist are not required to subscribe. Nonetheless, "penetration" is increasing rapidly in 1980-81, and some studies indicate that poor neighborhoods are subscribing in unexpectedly high proportions.

Two-Way Communication: Cable systems have the potential for interactive communication. "QUBE" in Columbus, Ohio, is the best known example of this capability. Its viewers can respond to questions or issues by pushing one of several buttons on their set; their answers are registered and tabulated by computer. Instructional use of this feature is being tested this year in the San Diego area. Probably the quality and frequency of such interactive uses of cable will increase rapidly and widely within the next five years.

National Developments Influencing Cable and Broadcast Television

Several activities at the national level are likely to have major implications for California regarding the educational potential of television:

"PTV-3": The Public Broadcasting Service plans to begin its first "Adult Learning Programming" schedule in Fall 1981. This new PBS service, "PTV-3," hopes to extend postsecondary instructional programming to viewers nationwide via public television stations which will receive it from a common source. Most of the new programming will be designed for incorporation into college-level courses, but some of it for teacher in-service education.

The nine college-level course series that will be available free to all local public stations in Fall 1981 are:

American Government Survey (political science)
The American Story: The Beginning through 1876 (history)
Cosmos (astronomy)
Contemporary Health Issues
Humanities Through the Arts
Interaction (teacher/parent inservice education)
It's Everybody's Business (business)
The Shakespeare Plays (English drama)
Understanding Human Behavior (psychology)

At present, however, few California institutions plan to pay the fees required to co-sponsor these national offerings and, in some cases, the air time charges levied by the public television station in their area. Because California's Community Colleges already have developed effective ways of cooperating for offering tele-

courses economically, because they themselves are major producers of such courses, and for other reasons, further negotiations among PTV-3, local public television stations, and California's collegiate institutions will be necessary, if this promising new service is to have its optimal impact on higher education in the State.

Annenberg Grant: The Corporation for Public Broadcasting, advised by its committee on education, is now planning details of how it will apply Walter Annenberg's grant of $150 million for educational uses. The grant will provide $10 million per year for the next fifteen years, and the donor's intent is that it result in a corpus of instructional programs or "software" for a complete bachelor's degree curriculum. The combination of this grant and the PTV-3 programming of PBS is expected to have an important, albeit delayed, impact on California's own activity in televised instruction at the college level.

National University Consortium: This consortium, noted above and headquartered in the University of Maryland's University College, plans to make a complete bachelor's degree program available to home-based adult students by means of Maryland's adaptation of the directed study system developed by Britain's Open University. While instruction is primarily via print, most courses include a broadcast video presentation on alternate weeks. Now operating through ten public televisions stations and seven colleges across the United States (including KCET-TV, KQED-TV, California State University, Dominguez Hills, and the University of San Francisco), the Consortium will end its pilot period this year and expects to have an external evaluation of its pilot operations ready by this fall.

"To Educate the People" Consortium: With funds from the federal Fund for the Improvement of Postsecondary Education (FIPSE), Wayne State University in Detroit plans to extend its "To Educate the People" Consortium into twelve states and Canada by Winter, 1981. It expects adaptations of "To Educate the People" to be established in seven California locales where there are collaborating public television stations. With promotion and encouragement from national labor organizations, "To Educate the People" makes use of twelve video series and a special bachelor's degree curriculum in offering a college education to a specialized clientele of adult workers.

Changes in Federal Policy: Cutbacks in the federal budget are likely to affect public television and the Corporation for Public Broadcasting, and may lead to the demise of the National Telecommunications and Information Administration (NTIA), recently established in the Department of Commerce to grant funds for public telecommunications planning and development. On the other hand, last year the Federal Communications Commission decided to authorize "a new class of low cost, low-power television stations with

. . . relaxed technical and operating rules," and "to give noncommerical and minority applicants a preference" as licensees for these low-power stations. 4/ It is estimated that a low-power station could begin broadcasting with less than $100,000. This opens a new range of possibilities for non-profit educational and community institutions at the local level to enter telecommunications. If cable companies fail to carry low power television (LPTV) locally originated programming, however, LPTV may prove viable only for large corporation networks.

Changes in California State Policy: The California Legislature is currently studying its appropriate role with regard to the cable industry and its franchises granted by local governments. Its so-called "deregulation" act (AB 699--Young, 1979) is scheduled for revision in 1983. Meanwhile, the industry is pressing for the least public regulation and the greatest private control of franchises. The outcome will significantly affect the amount of nonbroadcast telecommunication available for education in the State.

Creation of the Television Licensing Center: This Illinois-based center opened in 1980 as a national clearinghouse to provide educators with information about off-air videotaping and with licenses to record, duplicate, and retain television programming. Because it offers educators a legal mechanism for acquiring and using copyrighted material at a fraction of usual costs, it is expected to expedite the off-air use by academic institutions and libraries of television material.

Creation of the Center for Learning and Telecommunications Within the American Association for Higher Education: The American Association for Higher Education, an association of educators concerned with the improvement of higher education, encouraged and began hosting this new Center in 1981 with foundation funds. The Center functions to gather and disseminate information about efforts to use all types of telecommunications in achieving postsecondary educational objectives not only in colleges but through libraries, businesses, unions, and other organizations.

Satellite Broadcasting: Finally, and potentially most influential, the Communications Satellite Corporation (COMSAT) has asked the Federal Communications Commission for permission to broadcast pay TV directly to American homes via satellite in 1983, in competition with both broadcast and cable pay TV. 5/

INSTRUCTIONAL TELEVISION FIXED SERVICE (ITFS)

A much higher part of the frequency spectrum than very high or ultra-high frequency television is reserved by law exclusively for

"instructional television fixed service" (ITFS) use by educational organizations. An ITFS licensee can transmit programs by broadcast, but unless special relays are used, the ITFS signals can be received only at line-of-sight points from the transmitter, usually within approximately a twenty-mile radius. One needs a special receiver to tune in ITFS programming; thus users generally gather at fixed locations, such as schools or public libraries, for viewing. Each transmitting point has up to four channels. ITFS usually employs telephone line talk-back equipment in order to provide an interactive learning situation for dialogue and questions and answers.

As of August 1980, there were forty-one licenses for ITFS held by California organizations, located from Redding to San Diego. Public school districts held fourteen of these licenses; public universities, another fourteen; independent universities, three; parochial schools, four; and non-academic institutions the remaining six (see Map D).

Examples of Instructional Uses of ITFS

California State University, Chico, is the point of origin for much live instruction transmitted through electronic media to many classrooms in the thirteen-county area served by the Northeastern California Higher Education Council. This growing communications network presently involves Chico, the University of California at Davis, six community colleges, and numerous community agencies; and employs broadcast and cable television, ITFS, and microwave transmission. The network began a decade ago with federal grants through the Commission to the campuses. Chico offers upper division and extension courses through an extended ITFS system in nine of the thirteen counties. Eight learning centers receive "live" classes; in addition, subscribers to Nor-Cal Cablevision in Marysville, Yuba City, Colusa, and Oroville can receive the same instruction in their homes by renting a small attachment to their television sets. During the first semester in which these courses were offered for credit) 230 ITFS students enrolled on campuses and 112 enrolled off campus.

Chico State and the University of California, Davis, are also linked via ITFS so that students of one institution can take courses from the other. Their ITFS system is used in addition for occasional student advising and for professional development conferences among specialists such as veterinarians and computer scientists. Plans are being made to increase the number of regional learning centers linked via ITFS within the Northeastern California Higher Education Council area, increase the cable company services for students to take courses in their homes, provide facsimile transmission equipment at selected sites, and use the ITFS system for professional relicensure activities when other courses are not scheduled.

MAP D

INSTRUCTIONAL TELEVISION FIXED SERVICE (ITFS) LICENSEES
AND TRANSMITTER LOCATIONS IN CALIFORNIA, AUGUST 1980

WBS California State University, Chico (Redding)
WAQ Regents of the University of California (Yuba City)
WSA Regents of the University of California (Sacramento)
WSA Regents of the University of California (Davis)
WAW Regents of the University of California (Vacaville)
WAC Regents of the University of California (Berkeley)
KTB Regents of the University of California (San Francisco)
KHU Regents of the University of California (San Francisco)
KZB Roman Catholic Welfare Corporation of San Francisco
WBY Regents of the University of California (Livermore)
KOG Stanford University (Los Altos)
KVK Fresno County Schools
KTD Fresno County Schools
KZM Fresno County Schools (Sanger)
KZN Fresno County Schools (Reedley)
WAQ Regents of the University of California (Goleta)
WAQ Regents of the University of California (Point Mugu)
KQI Pasadena Unified School District
KME University of Southern California (Los Angeles)
KSV Archdiocese of Los Angelas Education and Welfare Corporation
KVP Anaheim City Schools (Fullerton)
WAU Board of Education, Torrance Unified School District
KZH Board of Education, Long Beach Unified School District
KUP Anaheim City School District
KUZ Anaheim City School District
KSJ Santa Ana Unified School District
WBS San Diego County Superintendent of Schools
WCI San Diego County Superintendent of Schools
WDD San Diego County Superintendent of Schools
WBM San Diego State University
WTV San Diego State University

Source: Information compiled from the National Instructional Telecommunications Council, 1980 records of the Federal Communications Commission, and John P. Witherspoon.

California State College, Stanislaus, at Turlock is installing an ITFS system which will permit two-way transmission to its off-campus center in Stockton and other learning centers in the Central Valley region. As part of this system, plans are under way to enable Modesto Junior College to originate programs for these learning centers, and if Laney College in Oakland is successful in acquiring access to the ITFS system licensed to the University of California, it too will become a participant in this embryonic, intersegmental telecommunications consortium.

San Diego State University uses its ITFS system as a link with its campus in the Imperial Valley, reducing the need for travel by faculty and students. Some funds for its system came from a federal equipment grant administered by the Commission. The system is also used for continuing education of staff members in San Diego area hospitals, offering programs for senior citizens meeting in locations such as libraries, and involving county jail inmates in two-way discussions of legal issues.

The School of Engineering at the University of Southern California provides instruction via ITFS to engineers and scientists at their work sites in aerospace, electronic, and other technological firms in the Los Angeles area. USC also offers noon-hour secretarial skills and general business courses by ITFS to receiving points within twenty miles of the campus. Stanford University uses ITFS to reach some two dozen firms on the San Francisco Peninsula with engineering and business information, and Golden Gate University in San Francisco uses the Stanford network to offer a complete accredited MBA curriculum.

Within the University of California, Berkeley transmits engineering instruction via ITFS to eight locations in the Bay area from a classroom on the Berkeley campus. UC, San Francisco uses ITFS to link Bay Area hospitals for medical "grand rounds" and occasionally for nursing education programs. A proposal from the School of Nursing at Santa Barbara envisions linking UCSB with other University of California campuses in the southern half of the State for cooperation in the nursing program. And Santa Barbara currently provides between ten and twelve upper division and graduate engineering and computer science courses per semester via ITFS to the Naval Air Station at Point Mugu and to Vandenberg Air Force Base, as well as two or three liberal arts courses per semester to the Ventura Learning Center.

The San Diego County Department of Education operates a cable television-ITFS network that transmits teachers' in-service training programs and other instructional programs to the San Diego County schools. Programs are also transmitted by microwave to seven cable television systems for screening on their educational

access channels. In 1979, the County received $417,000 as a Public Telecommunications Planning Facilities grant to extend its network to 100 additional schools as well as to such community agencies as the County Sheriff's Department and San Diego area hospitals. 7/

In San Francisco, the Educational Television Center of the Roman Catholic Archdiocese uses four regional ITFS transmitters in combination with cable to reach sites throughout the Bay area with services including its "Senior University." The latter project uses interactive ITFS and on-site group leaders or instructors at a dozen locations in the region for education among senior citizens.

Features of Instructional Television Fixed Service Significant for Learning

Special features of ITFS affecting its use for postsecondary education include:

Low Cost: ITFS is far less expensive than a broadcast station or cable system.

Interactive Capability: The control of ITFS receivers at specific locations makes it adaptable for interactive two-way audio communication.

Versatile but Specialized Coverage: Distinctly different types of learners and institutions can be equipped to use the same ITFS at different times, such as schoolrooms by day and libraries or fire stations by night; and with use of relays, ITFS can greatly expand and multiply its limited line-of-sight outreach.

VIDEO AND AUDIO RECORDINGS

Long-playing stereophonic and quadraphonic phonograph records have been superceded by audiotapes, videotapes, and now by videodiscs for most educational purposes. The recording of aural or visual events for later playback has become as familiar to most Californians as the purchase of LP records and pre-recorded tapes. Cassettes have removed the problem of tangling audiotape and videotape and popularized their use. Audiocassette players seem omnipresent in California--along the sidewalk, as automobile tape decks, on the beach. Videocassette recorders (or "VCRs") are rapidly becoming common in businesses and in homes with color TV receivers, despite their high price compared to audiocassette players. But videodiscs are only now becoming known and marketed. They permit the recording of visual as well as sound impressions electronically on a flat disc shaped like a phonograph record. Over 50 thousand images or "frames" fit onto one disc, and each frame is individually num-

bered, enabling the player to select quickly any frames in any order from anywhere on the disc. Equally remarkable, videodiscs have the capacity for containing more than one sound track; therefore multilingual discs are beginning to appear.

Examples of Instructional Uses of Video and Audio Recordings

Almost all California Community Colleges now have special learning centers where students can play back taped video or audio instruction as well as receive tutorial or other one-to-one assistance. Some public libraries also have similar playback facilities--although their service in this field has been in jeopardy since the "Taxpayer Revolt" of 1978. Although persons with less than a median income may be unlikely to own videotape or videodisc players in the near future, there is no technological reason preventing them from having access to video recordings through community colleges or public libraries. (Map E shows the location of these institutions.) Four-year colleges and universities have playback facilities for at least some academic fields, although they tend to reserve the use of these facilities to currently enrolled students. All colleges that cosponsor telecourses make tapes available for replay in these facilities. "Mastery learning" thus becomes a greater possibility.

In 1974, Cosumnes River College in Sacramento and public libraries affiliated in the Mountain Valley Library System launched a unique demonstration project called "Telebrary." With federal grants through the Commission, this project involved the production of television programs on such consumer concerns as Social Security problems, Medicare and MediCal benefits, and housing for low- and middle-income families. Videotapes and players were distributed to sixteen small town libraries around Northern California for individual viewing and group discussion.

Since 1971, Continuing Education of the Bar, headquartered in Berkeley and administered by the University of California, has produced audio- and video-tapes as well as books and printed materials in carrying out its mission of continued professional development for attorneys around the State. By mailing cassettes to nearly four dozen sites throughout California for reference by members of the Bar, it provides an elegantly simple and economical model of using "appropriate technology" for continuing professional education.

The Department of Continuing Education in Nursing at the University of California, San Francisco, has published a catalog, Modularization of Instruction in Nursing (1977), which lists video- and audiotapes available for nursing instruction; these permit expanded independent study opportunities for nurses, especially registered nurses looking toward relicensure.

MAP E

CALIFORNIA'S 106 COMMUNITY COLLEGES AND 168 PUBLIC LIBRARIES

• California Community Colleges
• Public Libraries (not including their 2,753 branches, stations, and mobile library stops)

Source: Community college locations from Guide to California Colleges and Universities (Sacramento: California Postsecondary Education Commission, 1980, pp. A-19 - A-30. Public library locations from California Library Statistics and Directory 1980 (Sacramento: California State Library, 1980, pp. 159-162.

Among the nineteen police academies in the State, most use videotapes in their courses of training. Several police departments make extensive use of videotape facilities for both entry-level instruction of new officers and developmental courses for experienced officers.

General Motors Corporation has equipped twenty-three of its California facilities with videodisc players and plans to expand its use of videodisc for personnel information and training. Backing by such a major corporation will most likely influence the decisions of other firms to use videodiscs as well as accelerate the speed with which user costs of videodiscs diminish. In April 1981, Ford Motor Company announced it would change from videocassette to videodisc for its dealers to use in personnel training and customer information. California-based corporations using videocassettes for employee training include the Bank of America and Wells Fargo.

Among State agencies, the Department of Alcohol and Drug Abuse Programs uses videotapes for training county and local personnel in forty-four offices throughout the State. The Business and Transportation Agency uses them for training personnel in its savings and loan, insurance, and real estate departments. The Office of the Fire Marshal employs them for conveying fire safety information to lay groups, as does the Highway Patrol regarding traffic safety and the Department of Water Resources for public education on issues like the Peripheral Canal. And these agencies as well as the Departments of Developmental Services, Fish and Game, Food and Agriculture, and Motor Vehicles and the Franchise Tax Board use them for inservice training of their personnel.

Features of Video and Audio Recordings Significant for Learning

Long Life: Cassette tapes suffer little wear and laser-optical videodiscs apparently undergo no wear from repeated playing. They can thus be used for almost limitless repetition for mastery learning. They can preserve unique events for later, detailed study. Recorded material also can be analyzed, edited, and refined for maximum educational effectiveness.

Flexibility: Recordings can be used by students at their own best times. Audiocassette players can be battery powered and thus used anywhere, as in commuting by car. Individual images on videodiscs can be retrieved in any sequence, regardless of their original order, thus further individualizing instruction.

Comparatively Low Cost: Audiotapes are now very inexpensive, as are audiocassette players. Videodiscs, while they must be manufactured by commercial firms, promise to become cheaper than videocassettes and comparable to textbooks in price.

COMPUTER NETWORKS

Turning from the telecommunications media that permit transmission of video or photographic images to those limited to graphic images, the most obvious and ubiquitous example is the computer. Computer networks now serve important instructional as well as administrative and student informational uses in postsecondary education. Using a keyboard much like a typewriter, or in some cases even touching the screen directly with a special stylus, students can "summon forth" information either in graphic or verbal form on a TV-like screen. And because students interact with the material presented by the computer, they can determine the pace at which the lesson or dialog proceeds as well as, in some cases, the direction of the dialog.

Examples of Instructional Uses of Computer Networks

California schools and colleges commonly make use of computers for administrative purposes, but computer-assisted instruction (CAI) still is not common among them. The Center for Educational Technology at the University of California, Irvine, the primary creator of college-level computer-assisted instruction in California, has become nationally recognized for its CAI materials. Because the present report emphasizes off-campus and interinstitutional uses of telecommunications, these classroom applications of CAI will merely be noted here, but one project of Irvine's Center for Educational Technology warrants special mention because of its off-campus implications: The Center is placing "stand alone" computers with interactive science programs in Irvine's public library and other locations in an effort to increase general understanding among the public of the nature of scientific knowledge and the processes of understanding it.

One computer software system, EUREKA, contains current information on a regional basis within California about job openings and requirements as well as educational progams related to training for these occupations. Begun with a federal grant through the Commission, EUREKA is now operated by Contra Costa College, and is being used by some 300,000 Californians annually and is available at 120 sites around the State, including 105 schools and colleges.

Another computer system, PLATO, is probably the most extensive instructional computer system in California. Developed with the University of Illinois and now operated by Control Data Education Company of the Control Data Corporation (CDC) in Minneapolis, PLATO provides access with the proper code to over 800 courses or instructional modules in twenty-five disciplines ranging from astronomy to veterinary medicine. Terminals may be rented from Control Data Corporation, hooked into any telephone outlet, and linked to a

central computer in Minneapolis, or students may use PLATO at any of seven CDC learning centers in California. Fees are substantial, but credit is available from various universities and colleges for some of the courses, and CDC reports many contracts from large firms for training their personnel. University Extension at the University of California, San Diego, offers an instructional design course, CREATE, through the PLATO system. The Peace Officer Standards and Training Commission of the State (POST), currently engaged in setting standards and objectives for police training throughout California, is designing a PLATO-based course for police officers on firearms in conjunction with Control Data Corporation. And the United States Army is using PLATO for adult basic education at Fort Ord.

Approximately fifty of California's 168 public libraries now have interactive computer systems for use by clients for subject/topic bibliographic searches and for generating bibliographies from pooled library data. Under the California Library Services Act, the State currently is implementing a plan to link all public libraries electronically to create a common data base, so that the staff and the users of each library will be able to find out by computer the holdings of all other public libraries. This "Library Bibliographic Data Base" will contain information on the author, title, and key words of library holdings, available for quick retrieval when queried and for immediate updating when new holdings are acquired. The State's public libraries are also computerizing their abstracting and indexing data bases by making electronic versions of printed abstracts and indexes, such as the Reader's Guide to Periodical Literature, available on computer terminals.

Features of Computer Networks Significant for Learning

Two-Way Interaction: The user initiates action at any time and determines the pace and direction of instruction, within the constraints of the prepared program. Interaction between student and the author of a program can occur to a remarkable extent. Student responses can be recorded and used for faculty advisement or assignment of further work as well as for later pedagogical analysis of the program and student progress by the instructor.

Limited Access: For large computers, access time is limited and terminal area available only at limited sites. With a few exceptions, "software" programs or modules appropriate for postsecondary education are limited, although the potential coverage is very large. Even "minicomputers" or microprocessors, although much less expensive than "network" computers, are still relatively costly, and although they can be linked to videodisc machines for random access to recorded material, they cannot be linked to network computers. And many network computers are not compatible with each other, limiting linkage between systems.

SLOW-SCAN TELEVISION

"Slow-scan" television is the transmission of a series of still pictures, accompanied by an audio track, via microwave, regular telephone lines, or even radio broadcast on "Subsidiary Communications Authorization" (SCA)--essentially the "space" around the main FM radio signal that is available for ancillary special programming. Special equipment is required for transmission but not for reception. (Where SCA is used for the audio track, however, special receivers costing less than $100 are needed to receive SCA.)

Examples of Instructional Uses of Slow-Scan Television

So far, slow-scan television has not been used for education in California.

Features of Slow-Scan Television Significant for Learning

Limited Expense: Because the transmission of slow-scan still pictures requires much less band width than that for moving images, slow-scan is much less expensive than ordinary television.

Wide Coverage: Because slow-scan can be transmitted by radio, microwave, or telephone line, it potentially can reach most places in California.

Restricted Visual Content: Slow-scan is limited to still picture transmission and thus has the same limitations compared to regular television that film strips have had compared to motion pictures.

VIDEOTEX

Videotex involves the visual display of text or graphic information on a television screen, either at the bottom of the screen in addition to the regular picture or instead of the regular picture. Videotex information may be carried either through the air along with the regular television signal or through cables such as telephone lines. When transmitted by cable or wire, videotex can be fully interactive, with the student or user able to carry out a variety of transactions with it (including purchasing goods) and even send messages to other users.

Examples of Instructional Use of Videotex

Videotex is relatively new to the United States. The only videotex system in California is being developed on an experimental basis by KCET-TV, the public broadcasting station in Los Angeles, which is conducting research on potential applications of the French-devel-

oped ANITOPE videotex system for public broadcasting and educational use.

Features of Videotex Significant for Learning

Non-Scheduled Interaction: Once the user has the needed equipment to "call up" videotex information on a television set, he or she can initiate the process when desired and can communicate with other users as well as with the instructor.

Wide Coverage: Videotex could potentially be transmitted anywhere there are telephone lines in California, but it would be available only to persons with television sets.

ELECTRONIC BLACKBOARD

With an electronic blackboard, an instructor writes on what appears to be a standard blackboard while he or she lectures, and as the lecture is being transmitted to distant points by regular telephone lines, the writing on the blackboard appears on the screens of television monitors at those sites. A second audio circuit allows students to respond with comments or questions for the instructor. Special equipment is needed at both ends of the system, and line charges are made for use of the telephone system, as with similar devices.

Examples of Instructional Use of Electronic Blackboards

Cosumnes River College delivers courses to inmates of Folsom State Prison using an electronic blackboard. Its Spring 1980 algebra course presented the lectures by speaker and graphics on a television monitor in the prison from an ongoing class on the college campus, and the inmates had access to an audio talk-back capability.

Features of Electronic Blackboards Significant for Learning

Wide Coverage: Potentially anywhere with a telephone installation.

Restricted Scope: Well-suited for subjects such as mathematics or physics in which students need to see symbolic or graphic information accompanying a lecture, while picture background or composition are of little consequence; but limited to line drawings typical of blackboard sketches or diagrams.

TELEPHONE AND PICTUREPHONE

The standard, familiar telephone system is used for lectures and discussion classes by many postsecondary institutions around the country, with Wisconsin having the best known and most heavily used network. In addition, American Telephone and Telegraph has operated a pilot "Picturephone Meeting Service" at twelve metropolitan sites throughout the nation, including Los Angeles, San Francisco, and Sacramento, for video and audio conferences using earth satellite and telephone line technology. This service includes hard-copy transmission of documents as well as taping of the meeting, if needed. AT&T recently announced, however, that Sacramento will be dropped from these sites.

Examples of Instructional Use of Telephone and Picturephone

California State College, Stanislaus, and Deuel Vocational Institution in Tracy have cooperated in offering upper-division courses for inmates at Folsom State Prison, largely by teleconference. Four such courses were offered in the Fall of 1980 and by this past Spring, additional courses utilized an interactive microwave system.

Guest lectures in art history have been delivered from Berkeley to Stephens College in Columbia, Missouri, and elsewhere by means of long distance telephone, together with a sequence of photoslides which had been mailed beforehand for projection on-site to the classes.

The University of California, Santa Cruz, is equipped for two-way telephone transmission of seminars, conferences, lectures, research exchanges, and other communication through the PEACESAT Network of South Pacific island communities via the ATS-I satellite.

As part of San Diego's Adult Basic Education/English as a Second Language program, Dial-A-Lesson offers short taped English lessons to Vietnamese and Spanish-speaking students by telephone. Students are given the unlisted number at the beginning of the school year, and new lessons are assigned each week. The project, which has been in operation for three years, serves between 300 and 350 students each semester and receives between 1,000 and 1,200 calls a week.

"Tel-Med" provides the citizens of several California cities with short tape-recorded messages on specific health-related problems when they call the local Tel-Med number listed in their telephone directory and ask to hear a particular tape. The service is funded by a combination of medical councils, corporations, and other donors in each city.

Some thirty-five public libraries in California use telephone lines to transmit other audiotaped educational material to callers, including information on consumer protection, solar energy, and law--the latter through "Tel Law."

Among State agencies using teleconferences for inservice staff development are the Department of Corrections and the Department of Health Services. The Department of General Services has made use of the Picturephone Meeting Service between Sacramento, San Francisco, and Los Angeles, as has the advisory committee of the Postsecondary Education Commission for the project that led to this present report.

Features of Telephone and Picturephone Significant for Learning

Two-Way Interaction: Telephone and Picturephone Meeting Service is fully interactive.

Differential Coverage: Telephone lines link virtually every household in California (all but 3 percent) and the United States. Thus more Californians have access to information by telephone than by any other means of telecommunications. In contrast, users of the Picturephone Meeting Service must convene at special sites owned by telephone companies, of which only twelve currently exist nationally, and the number of participants must be limited to approximately eighteen for adequate viewing.

BROADCAST RADIO

Radio is nearly the oldest and most widespread form of telecommunications, with a long history of use in education. Anything that is broadcast by radio can be taped, replayed, tested, edited, and refined for further instructional use. FM radio stations can use "Subsidiary Communications Authorization" (SCA) as a means of providing special programming to particular audiences such as the blind or the sight-impaired, as well as for stereo broadcasting.

Examples of Instructional Use of Radio

The archetypal example of using radio broadcasts for instruction occurred when California and other states turned to radio for the widest possible dispersal of current agricultural information for farmers. Since 1956, Cooperative Extension has prepared its own tapes for radio broadcast. Now numerous State agencies make use of radio, from short "public service" spots to full-length programs.

The University of California produces two familiar weekly radio programs: "The University Explorer" and "Science Editor." In

1980, it added Spanish language news programming as another public service. Many high schools and colleges operate low power radio stations for student training and for educational transmission around the campus. California's twenty-one public FM radio stations receive national programming via satellite and provide a network large enough to ensure a wide variety of well-produced educational programs.

Many public libraries continue to use radio to broadcast regularly scheduled "book talks" and book review programs.

Some schools are using radio to train children in specific listening skills, in order to balance the currently overwhelming effects of visual stimuli in the culture.

At San Diego State University, KPBS-FM has a grant from the Fund for the Improvement of Postsecondary Education (FIPSE) to prepare college-level credit courses for radio transmission by Subsidiary Communications Authorization (SCA). Along with three other California public radio stations--KCSM-FM in San Mateo, KLON-FM in Long Beach, and KPCS-FM in Pasadena--it has helped pioneer SCA programming for the blind and sight-impaired. It offered the first two of the SCA courses this spring.

Features of Radio Significant for Learning

Wide Coverage: Most Californians, even among the disadvantaged, have AM radios, and many have FM sets or AM/FM combinations. California's public radio stations recently received a planning grant to examine extension of public radio coverage to 95 percent of the State's population. Three of the nation's four bilingual public radio stations are in California.

Mobile Reception: Battery-operated receivers and automobile radios permit reception away from home, work, or campus and while traveling.

One-Way Transmission: Except for "talk shows," broadcasting permits no two-way dialog. Without recording equipment, listeners must adhere to fixed schedules of broadcasts.

NEW WAYS TO TRANSMIT TELECOMMUNICATIONS SIGNALS

Two recent technological developments--satellites and microwave--warrant mention here, although they only multiply the ways of distributing the types of audio, video, and data signals discussed above.

Satellites: Communication satellite systems transmit signals from a given point (the "uplink") to the satellite, then down again to the entire area on the earth (the "footprint") served by the satellite. Anyone with a proper receiver dish or "downlink" within this area can receive the signals, which are then used for audio, video, or data transmission. If the intended audience or user groups are not at the downlink site, the signals can be transmitted to them from the site by some other means, such as cable, broadcast, or microwave.

Microwave: Microwave transmission permits beaming signals from point to point along a straight line with relays used to extend the range of transmission beyond line of sight. Today, microwaves are used as carriers for all types of signals and are supplementing and in some cases superceding the use of telephone lines and cables.

Examples of Satellite and Microwave Uses

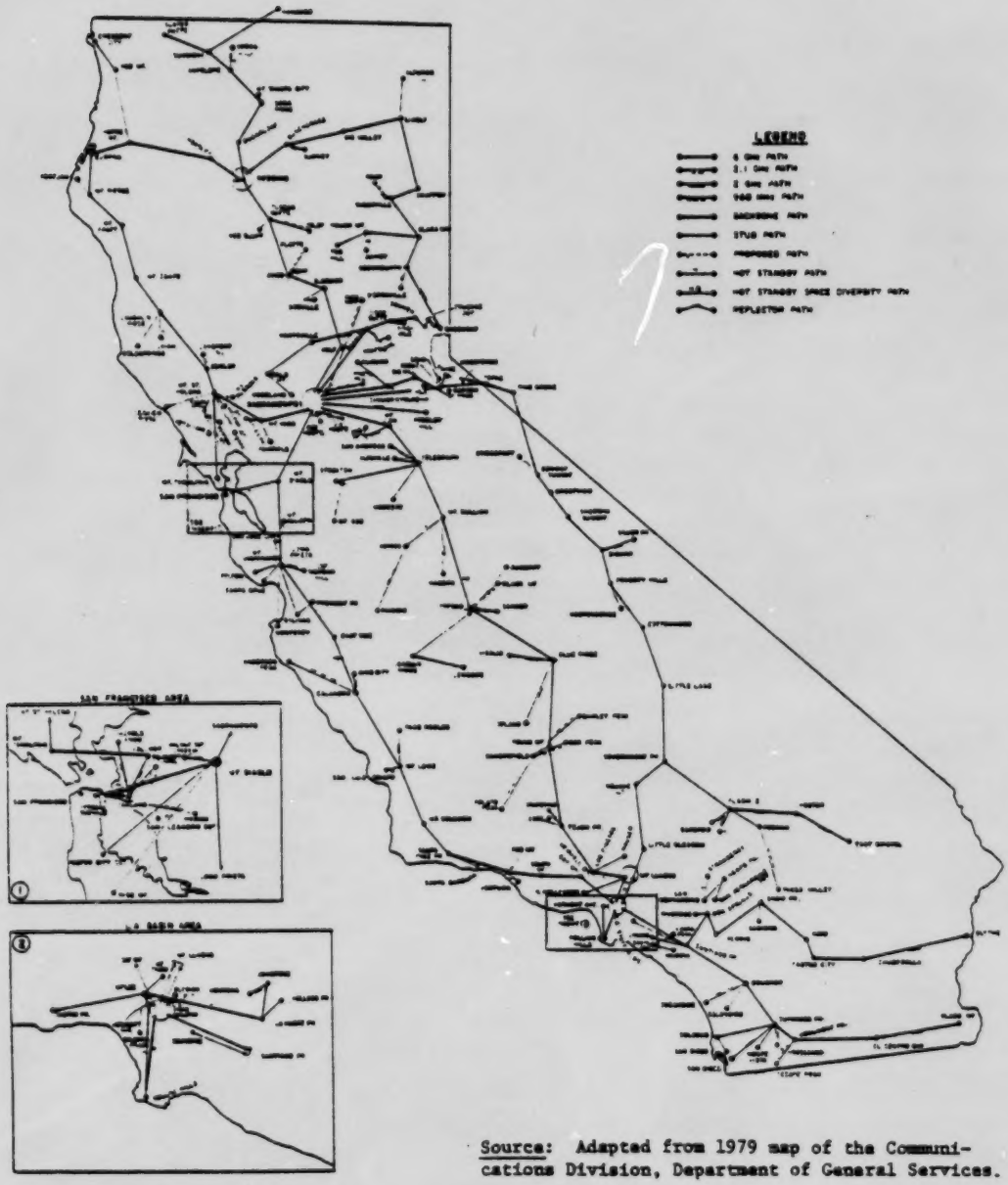
Satellites: The numbers of both uplink transmitters and downlink receivers in California are increasing rapidly, but as yet few educational institutions have this equipment. Currently Modesto Junior College, with its downlink dish, affords the Central Valley its route for receiving educational programming via satellite from other states; one public library has its own dish for satellite reception; and a number of cable systems have inaugurated satellite-to-cable transmission. Eventually home satellite receivers may become popular, if the Federal Communications Commission permits the Communications Satellite Corporation to broadcast pay TV directly to subscribers from its COMSAT satellites. At present, the major development regarding satellite communication for education in California is the plan by the California Public Broadcasting Commission for two-way use of the WESTAR satellite to interconnect public broadcast stations in the State. A WESTAR uplink currently exists at KQED in San Francisco; with a similar uplink in the southern part of the State, the public broadcast stations will be essentially interconnected for complete exchange of programming.

Microwave: The largest public microwave system in California is the State's Public Safety Microwave System. The primary purposes for this Statewide system are emergency services such as fighting forest fires and providing police bulletins. In general, this system is used up to only 40 percent of its signal-carrying capacity, and its management is seeking to extend its usage further (see Map F).

The California State University and Colleges has completed an engineering study toward connecting all nineteen campuses and the Chancellor's Office building in Long Beach via microwave and instructional television, fixed signal (ITFS), for both administrative

MAP F

CALIFORNIA PUBLIC SAFETY MICROWAVE SYSTEM



Source: Adapted from 1979 map of the Communications Division, Department of General Services.

and instructional telecommunications. This year, the State University system has requested federal funds to help complete that portion of this network from Chico and its Northeastern California Higher Education Council affiliates to other CSUC campuses southward as far as Bakersfield.

Stanislaus State College, Modesto Junior College, and several other mid-state community colleges have begun forming the Higher Education Consortium for Central California, modeled after the intersegmental effort of the Northeastern California Higher Education Council. By using satellite and microwave as well as cable and instructional television fixed service, this Consortium can span the Central Valley and foothills with a wide range of programming, from lower division courses through inservice education for professionals.

The University of California, Los Angeles, has contracted for a feasibility study of linking the five southern UC campuses-Irvine, Los Angeles, Riverside, San Diego, and Santa Barbara--by microwave for handling television and audio signals and the exchange of academic programs. Major impetus for the network has come from several schools of engineering and nursing.

Other University of California campuses have plans on an individual basis to make fuller use of existing microwave and ITFS capabilities, mostly for exchanging medical and engineering information with government and business clients. Already, microwave connects the University Hospital in San Diego to the Basic Science Building on the La Jolla campus for audio and video transmission. In all, at least eleven hospitals in California are linked with major university campuses either by microwave or cable for two-way learning in medical and health science fields. And a universitywide task force has been formed to determine campus academic needs in preparation for designing a telecommunications network to serve both administrative and academic functions among all nine campuses by means of one system compatible for all.

Features of Satellites and Microwaves Significant for Learning

These additional ways of sending or carrying electronic signals can increase both the amount of material available to learners and the extent to which it can be distributed quickly statewide.

CONCLUSION

In the three years since the Commission issued Using Instructional Media Beyond Campus, telecommunication technology has been used

more and more for instruction. Despite the effects of Proposition 13, community colleges have continued strong sponsorship of telecourses; regional consortia have aired more telecourses per semester; and enrollment in these courses has increased. In the same period, the educational use of nonbroadcast technology has accelerated even more rapidly: Cable television has expanded its geographic coverage significantly, with at least thirty California cities investigating the possibility of new cable franchises during the past six months.

Large corporations have adopted nonbroadcast media such as video recordings for employee training. Computer-assisted instruction has begun to be marketed statewide and nationally. Videodiscs have appeared on the market, receiving significant endorsement of purchases by several large corporations. Videocassette makers have developed ways to link videocassette recorders to minicomputers, thereby allowing teachers and learners to program their own tapes for individualized instruction.

Consensus is growing among educators, training directors, and media specialists that in the future most educational uses of telecommunications will be through nonbroadcast rather than broadcast media. This seems likely both because of the ability of nonbroadcast media to reach smaller and more specialized groups and because the number of broadcast hours available for instruction has an absolute limit, which has nearly been reached in some broadcast areas. In view of the increasing range of choice available, educators will make their reliance on broadcast distribution more selective.

The following two tables summarize the current state of instructional telecommunications in California, based on the information in this chapter. Table 1 lists each of the types of technology and its features, estimates its coverage in California, offers examples of its use, and notes its features affecting its educational use. Table 2 lists uses of these technologies by State agencies other than academic institutions.

As these tables and this chapter demonstrate, California possesses immense telecommunications capability. How this resource can be better used for education is the subject of the remainder of this report.

TABLE 1: TELECOMMUNICATIONS TECHNOLOGY

TYPE OF TECHNOLOGY	CONTENT TRANSMITTED	RECEIVING EQUIPMENT NEEDED	FEATURES AFFECTING INSTRUCTIONAL USE	COVERAGE IN CALIFORNIA
Broadcast Television	Moving visual images in color with sound	Television set	Fixed scheduling but can be taped for repetition. Enables on-site, firsthand viewing of one-time events. Variety of special effects are possible to stimulate and motivate. No limit to potential number of auditors or "samplers." Not interactive: no immediate dialogue. Captioning possible for deaf. Available to homebound and institutionalized.	Television broadcast stations reach over 95 percent of Californians. Twelve public stations reach 4 million each week and can reach 90 percent of population. Commercial stations have donated up to two-fifths of all instructional time; public stations the other three-fifths.
Cable Television	Same as broadcast television	Television set with subscription cable connection	More channels and therefore more time potentially available for instructional programming than on broadcast television. Can be used interactively. Technical level and expense not as stringent as for broadcast. Target audience can be specialized or small. Fixed schedule as now used. Available only to subscribers.	Approximately 2 million subscribers. Two hundred ninety cable systems in 800 California communities. Number of systems and degree of penetration increasing rapidly. One study indicates high subscription in poor neighborhoods, despite costs.
Instructional Television Fixed Service (ITFS)	Same as broadcast television	Special television receiver controlled by ITFS operator	Uses either taped or live instruction. Adaptable for interactive learning. Control of access permits specialized content to selected groups and to different types of users. Far less expensive to operate than cable or broadcast systems. Each operator limited to four channels. Limited range without microwave relays.	Forty-one ITFS licenses have been awarded in California. Public universities and public school districts each hold fourteen; parochial schools, four; and independent universities, three.

ORGANIZATIONAL EXPERIENCE OF CALIFORNIA INSTITUTIONS

Telecourses are offered for credit by over eighty community colleges. Up to twenty senior colleges and universities offer credit courses via extension or continuing education divisions. Five regional consortia provide community college cooperation, cost-sharing in leasing, advertising, airing, producing, and marketing the telecourses. University of California, San Diego, Extension writes study materials to accompany national series such as "Ascent of Man." Two public broadcast stations are currently scheduling college-level programming from the east coast. Three independent universities have used broadcast television in credit courses. Three groups of California institutions are among the top six producers of telecourses for broadcast in the United States.

University of Southern California has aired telecourses via cable since 1978. Many community colleges as well as several university extension divisions extend their telecourse distribution via cable, especially in the San Diego area.

Several public libraries have production capabilities for cable programs. One houses the "head end" of a cable channel.

San Diego State University uses ITFS as a link with its campus in the Imperial Valley for continuing education of area hospital staff, informational programs for citizen groups meeting in community centers, and legal discussions involving inmates of the county jail. Both Stanford and USC use ITFS to provide on-site instruction in engineering, management, and other subjects to private firms in their regions. Golden Gate University offers a complete MBA program via Stanford's system. Northeastern California Higher Education Council of Chico State and other institutions and community agencies combines ITFS, cable, and microwave transmission to provide credit instruction to a thirteen-county area. The Roman Catholic Archdiocese of San Francisco offers educational programming to the elderly via ITFS, beamed to convenient locations for group discussions.

(continued)

TABLE 1: TELECOMMUNICATIONS TECHNOLOGY CAPABLE

TYPE OF TECHNOLOGY	CONTENT TRANSMITTED	RECEIVING EQUIPMENT NEEDED	FEATURES AFFECTING INSTRUCTIONAL USE	COVERAGE IN CALIFORNIA
Video and Audio Tapes	Video same as TV above. Audio same as radio below	Playback unit	Permits repetition for mastery learning. Can be used on student's own schedule, made available from common repository such as library or learning center. Can be edited and refined for maximum effectiveness. Audiotapes inexpensive and widely used. Videocassette recorders (VCRs) still expensive.	Nearly all community colleges and many public libraries have both audio and video playback facilities. Many employers use them for employee training. Audio cassettes ubiquitous.
Video discs	Same as TV plus stop-action and several audio-tracks	Playback unit. Minicomputer optional	Same as above features of videotapes plus can be stopped, reversed, and, with minicomputer can be programmed to any sequence of frames. Can switch among alternate soundtracks.	Disc players only now being marketed. Not yet commonly available. Expensive, although eventually videodiscs may approximate the cost of textbooks.
Computer Networks	Alphanumerics and graphics on display; hard-copy data from data banks.	Computer terminal linked with network	Interactive with computer program. User initiates action at convenient time. Student responses can be recorded and analyzed for individual assistance and pedagogical analysis. Composite data base potentially very large. Many network computers not compatible.	All public colleges and universities have terminals on campus. Some fifty public libraries can undertake topic searches and bibliography building. EUREKA system for career and education information now at 120 sites, used by 300,000.
Microprocessors or minicomputers	Same as computer network except no multiple storage or hard-copy.	"Stand alone" computer with computer program	Self-contained for home or small institution use. Much less expensive than network computer. Easily connected with other components such as videodiscs. Interactive with computer program. Limitless repetitions possible. Radically declining cost.	Actual coverage not known, but no technological barrier to complete availability to everyone.

ORGANIZATIONAL EXPERIENCE OF CALIFORNIA INSTITUTIONS

Certain professions make widespread and frequent use of cassette instruction; among them, law, nursing, engineering, and business management. Audiocassettes especially common to foreign language, psychology, and history students. All California public colleges and universities that regularly cosponsor telecourses retain (at least temporarily) tapes of the instructional broadcasts. Many public libraries individually stock a few educational tapes for on-site use. Growing numbers of corporations, including Bank of America, Ford, General Motors, and Wells Fargo, use videocassettes for inhouse training, general education, and information, assuring consistency throughout the organization.

General Motors has purchased videodiscs and players for training at its plants including those in California.

Education Technology Center at the University of California, Irvine, is one of the nation's chief public creators of college-level computer-assisted instruction (CAI) programs. It currently has "demonstration" computers in public libraries and shopping centers for use by interested people.

Control Data Corporation has seven centers and many corporate clients in California, including the U.S. Army, for its PLATO system of instruction, which offers modules or courses on over 800 topics.

Most pervasive use at present is for videogames at home and entertainment centers.

(continued)

TABLE 1: TELECOMMUNICATIONS TECHNOLOGY CAPABLE

TYPE OF TECHNOLOGY	CONTENT TRANSMITTED	RECEIVING EQUIPMENT NEEDED	FEATURES AFFECTING INSTRUCTIONAL USE	COVERAGE IN CALIFORNIA
Slow-Scan Television	Audio but only still video	TV set with special receiver; either telephone or microwave link	User determines the time and place of transmission. Can provide inexpensive link with libraries' bibliographic materials and other linear-graphic information. Limited to still picture comparable to slide show.	Can be transmitted to any site with telephone lines or microwave system.
Videotex	Alphanumerics and graphics	TV set with special receiver; telephone	Interactive and user-initiated (non-scheduled).	Potentially available anywhere with telephone service.
Electronic Blackboard	Audio, alphanumeric or linear figures drawn black board	TV set with conference telephone connection	Interactive in audio portion. Can include participants at more than two locations. Concentrates attention on symbolic information being drawn on the blackboard.	Potentially anywhere with telephone service.
Telephone	Audio but add-on systems add visual capability	Basic telephone line service plus attachments for special service	Fully interactive. Commonly accepted. Limited without attachments to audio signals.	Ninety-seven percent of California homes have basic telephone service.

ORGANIZATIONAL EXPERIENCE OF CALIFORNIA INSTITUTIONS
No educational use as yet in California.
KCET-TV (Los Angeles public broadcasting station) is currently experimenting with videotex in California.
Cosumnes River College has used the electronic blackboard in providing mathematics courses to prison inmates.
Some thirty public libraries transmit audiotaped information via telephone on consumer topics, solar energy, and legal issues. Guest lectures can be coordinated with photoslide sequence mailed in advance.

(continued)

TABLE 1: TELECOMMUNICATIONS TECHNOLOGY CAPABLE

TYPE OF TECHNOLOGY	CONTENT TRANSMITTED	RECEIVING EQUIPMENT NEEDED	FEATURES AFFECTING INSTRUCTIONAL USE	COVERAGE IN CALIFORNIA
Picturephone	Audio plus video of conferees; hard-copy	Service available at only three sites in California	Fully interactive. Number of participants limited to approximately eighteen. Available sites limited to telephone company facilities in a dozen cities nationally.	Los Angeles, San Francisco, and Sacramento currently served; Sacramento scheduled to be dropped.
Broadcast Radio	Audio	Radio set (receiver)	Very mobile reception (in cars or while walking or jogging). Fixed scheduling but can be taped for repetition. Enables first-hand hearing of one-time events. No limit to potential number of auditors or "samplers." Not interactive: no immediate dialogue. Available to homebound, institutionalized.	Nearly all Californians have AM radios; many have FM. California's 21 public radio stations (all FM) can reach 95 percent of population. Three of the nation's four bilingual stations are in California.
Satellite	Any electronic signal	"Downlink" parabolic dish receiver	Presently transmit video, audio, and data signals to specialized receivers within the "footprint" of the satellite on the earth. Permit transmission of many signals at once, avoiding congested telephone lines. Transmission may be impaired by electrical disturbances in the atmosphere.	Home reception of satellite signals not yet economical but may become common if eventually authorized and less expensive. Plans are under way to link public broadcast stations in California for exchange of programs.
Microwave	Any electronic signal	Parabolic dish receiver	Microwave transmitters beam signals from point to point along line of sight.	Extensive use by communications industry. State Public Microwave System used by State agencies for emergencies.

ORGANIZATIONAL EXPERIENCE OF CALIFORNIA INSTITUTIONS	
	Several state agencies have used Picturephone Meeting Service for conferences, as have business and civic groups.
	Earliest extensive use of radio for education in California was by Cooperative Extension to transmit agricultural information to farmers; now most State agencies employ it for announcements and instruction. Colleges, universities, and libraries schedule public service programs on research and books. KPBS-FM at San Diego State University is developing college-level credit courses for radio transmission, particularly to the visually-impaired. Many schools and colleges operate low power stations.
	Presently only a few educational institutions and libraries have satellite receiving equipment. Among them, Modesto Junior College is receiving educational programming from east of the Sierras via satellite, and the programs are being transmitted in the Central Valley by cable.
	Only limited use as yet by educational institutions, such as those participating in the Northeastern California Higher Education Council. The California State University and Colleges is considering it to link all 19 campuses.

TABLE 2: CALIFORNIA STATE AGENCY USES

AGENCY OR UNIT	LEARNERS OR AUDIENCE	PURPOSE OF COMMUNICATION	NATURE OF COMMUNICATION
Aging, Commission on	Elderly population	Inform about services relevant to aging	Information spot announcements
Alcohol and Drug Abuse Programs, Department of	County and local personnel (forty-four offices)	Training	Videotapes, training films
Business and Transportation Agency	Personnel of Savings and Loan Department, Insurance Department, Real Estate Department	Training	Videocassettes; taping live programs
Conservation Corps	New CCC recruits, prospective recruits, agencies that might sponsor CCC projects	Training and orientation, information and motivation, public understanding of program	Documentaries, news features, and announcements
Communications Division, General Services	Forestry, police, and other agencies combatting emergencies	Information, instant consulting	Spoken
Consumer Services Division of Consumer Affairs Department	General public ("consumers")	Information "tips"	Public service announcements, "spots," two films
Corrections, Department of	Prisoners at Folsom	Instruction	Mathematics and other college-level courses
	Prisoners at Frontera and San Luis Obispo	Adult Basic Education	
	Prisoners at Deuel Vocational Institution (Tracy)	Upper division college instruction	
	Administrative staff and parole officers	Information and inservice training	Teleconference
Developmental Services, Department of +	Professional and technical personnel	Training	Television

*These findings are from an exploratory (not exhaustive) survey by the Commission staff during the summer
+Not included is information on 36 boards and bureaus under this agency.

DISTRIBUTION TECHNOLOGY	ORIGIN OF SOFTWARE	PLANS FOR INCREASED USE OF TELECOMMUNICATIONS
Radio and television broadcasts by thirty-three area agencies	Locally contracted producers and stations	None at State level.
Mail to clinics, recovery homes	-----	-----
Mail and off-air taping	Multiple	Anticipate using Picturephone Meeting Service of AT&T for staff meetings
Broadcast (public service spots), TV and radio, mail	-----	Videoconferences via "down-time" of public television stations, two-way radio for firefighting emergencies, public television stations linking several CCC "bases"
Public Safety Microwave System (See Map E)	Mostly live	
Radio and television public service spots, mail		Consider expanding radio spots
Electronic blackboard (phone lines) Computer-assisted instruction Interactive microwave and videocassette	Cosumnes River College Control Data Corporation (PLATO system) Stanislaus State College Commercial	Intersegmental Planning Committee working toward system for prisoner education and staff training with both microwave and closed-circuit television cassettes
Videocassette	In-house studio	

(continued)

of 1980.

TABLE 2: CALIFORNIA STATE AGENCY USES OF TELE-

AGENCY OR UNIT	LEARNERS OR AUDIENCE	PURPOSE OF COMMUNICATION	NATURE OF COMMUNICATION
Emergency Services, Office of	Law enforcement entities	Instant multipoint conferring and information exchange	Emergency information
	Fire-fighting (other than forestry)		
Fire Marshal, Office of	Public officials (e.g., school administrators)	Information about regulations, Safety Code and enforcement	Computerized data
	General public	Fire safety information/ education	Videotapes
	Management personnel	Executive training	Audio cassettes
Fish and Game, Department of	Office personnel	Information transmittal for enforcement Conservation education Training	License information N/A Videotapes
Food and Agriculture, Department of	Urban public	Information on how to buy produce directly from farmers	Announcement about program; directions specific to type of food
	Agency personnel	Training (inservice)	Formal instruction (e.g., pesticides, investigation, interviewing)
	Administrators	In-house information and national developments	Two or more nationwide bulletins a week; director's monthly address to managers
Forestry, Department of	General public	Prevention of forest fires (education)	Films for TV and spots
Franchise Tax Board	General public	Taxpayer information	Spot announcements with IRS cosponsors
	Agency personnel	Inservice training	Videotaped and audiotaped instruction
Health Services, Department of	Agency personnel	Information on disease outbreaks, transmission	Fascimile hard copy
	Agency personnel, plus local health departments and clinics	Training in laboratory technical procedures; laboratory-related contacts with local professionals	
	UC Graduate students	Graduate credit course	Laboratory subject matter

DISTRIBUTION TECHNOLOGY	ORIGIN OF SOFTWARE	PLANS FOR INCREASED USE OF TELECOMMUNICATIONS
Public Safety Microwave System and twenty mobile vans	Mostly live	
	Production studio, in-house	
Computer network	In-house	Interest in hard-copy transmission among regional offices
N/A		
Mail		
Television broadcast		
Radio broadcast spots		
Watts line telephone		
Tapes in five district offices	U.C. Davis and Water Resources Department	
Telecopier to director		Interest in Picturephone Meeting Service of AT&T for agency meetings
Videotape, mailed to department offices statewide	UC Davis and Water Resources Department	
Television broadcast on commercial stations	Water Resources Department	None
Radio broadcast		
TV and Radio broadcast	IRS	
Sacramento office		Interest in computer-assisted instruction package for in-service training
Telecopier in three field offices		
Telecon network, statewide		Increase use for laboratory training, including other states' sources of instruction
Telecon network, statewide		Emergency communication between State laboratories and local authorities

(continued)

TABLE 2: CALIFORNIA STATE AGENCY USES OF TELE-

AGENCY OR UNIT	LEARNERS OR AUDIENCE	PURPOSE OF COMMUNICATION	NATURE OF COMMUNICATION
Highway Patrol	Agency personnel	Inservice training	Instruction, information
		Dispatching officers and cars	Bulletins, orders
	General public	Information, motivation	Feature film on video
Justice, Department of	Agency personnel	Information	Data copy
Mental Health, Department of	General public by specific age groups	Preventive education for mental health (see right column)	-----
Motor Vehicles, Department of	Agency personnel	Training	Instruction, information
Parks and Recreation, Department of	Agency personnel (including park and ranger units)	Communication, administration	
	Visiting public to park museums	Educational	Commentary on displays
Personnel Board	Agency personnel and applicants	Inservice training	Demonstration of interview techniques
Solid Waste Management	General public	Public information and awareness	Spoken message by Board member(s)
Secretary of State	General citizenry	Education and motivation	Taped message of instruction and encouragement on registering to vote.
Transportation, Department of		Remote base control	
	General public	Information	Announcement
Water Resources, Department of	Agency personnel	Inservice training	
	General public	Education, awareness, (e.g., Peripheral Canal)	Feature films, news briefs, spot announcements

DISTRIBUTION TECHNOLOGY	ORIGIN OF SOFTWARE	PLANS FOR INCREASED USE OF TELECOMMUNICATIONS
Videocassettes	Academy studio	Plan to equip all operational commands with videocassette recorders
Public Safety Microwave System	Live	Satellite communication for statewide uses
Cassettes mailed for group presentation	Academy studio	
Computer on telephone lines	Departmental offices	
-----	-----	Currently discussing using television broadcast distribution for educating the general public in preventive measures for mental health, by age group (e.g., juvenile, mid-life, retired, etc.)
Videocassettes at training centers with personnel		
Public Safety Microwave Network		
Hand-held speakers, actuated by each segment of display from audiotapes		
Videocassette On-site audiocassette	In-house	Plan videotaping of oral interviews for use of deaf applicants
Radio and television broadcast	Private firms by contract	
Radio and television broadcast (public service announcements)	Contracted	None
Public Safety Microwave System Radio and television broadcast (public service announcement)	In-house Graphic Services Branch	None
Videocassettes at ten locations Videocassette and film library, mail	In-house Graphic Services production center	

2 FUTURE PROSPECTS

Chapter One surveyed California's public resources and plans for educational telecommunications. This chapter considers ways to make fuller use of these resources for dealing, through education, with some of California's persistent and costly societal problems. Several broad fields of understanding are widely needed by Californians beyond the age of compulsory schooling for the State's social and political structure to function well and remain stable and vital. A review of numerous public reports by government bodies and respected private groups such as the Carnegie Commission on Higher Education reveals broad agreement on at least five of these areas of knowledge as major social needs (Appendix C lists these reports):

- Basic adult competencies or survival skills.
- Understanding of government, public issues, and services.
- Employment information and occupational skills.
- Social responsibilities and individual development.
- Continuing professional development.

Obviously these five areas of learning do not exhaust the list of skills and knowledge that Californians may need; but they represent areas of understanding in which the State has obvious interest. For most of them, courses are already available in standard college degree curricula; but for all of them, electronic communication can extend the potential of courses and other forms of teaching.

For each of these five areas of needed education, the following pages illustrate (1) special characteristics of learners that favor the use of one technology over another (for example, can they easily gather for meetings, or can they afford to pay much for instruction); (2) existing technologies for meeting the need (for instance, what forms of telecommunication are already available statewide and relevant for this purpose); and (3) interested organizations (such as State agencies or professional associations that might participate in cooperative efforts with educational institutions to meet the need).

Obviously there is more than one good way to use communications technology to expedite learning. Nonetheless, statewide planning for coordinated use of telecommunication media is limited by certain

practical considerations, such as California's existing investment in various media and the economics of alternative media. The challenge facing statewide planners is to determine economical courses of action that will enhance essential learning by Californians on a statewide basis while at the same time not inhibiting any additional diversity or technology for learning that can be supported at the local level.

BASIC ADULT COMPETENCIES OR SURVIVAL SKILLS

To sustain a free society and a dynamic economy, citizens must have certain skills to be self-reliant and contributing members. Among these skills are a workable level of literacy in reading, writing, and speaking English; usable arithmetic; a knowledge of personal finances; an understanding of important laws and prevailing customs; and personal confidence to function effectively in a complex society (for example, in discussing a complaint with the utilities company). Yet some four million of California's sixteen million adults lack one or more of these minimal levels of competence necessary for getting along independently and normally in California life, according to a survey conducted for the State Department of Education. 6/ Adding steadily to these adult ranks are large numbers of high school youth who earn less than adequate scores on job placement or college entry tests, particularly in verbal and computational skills. Even among those who do enter college, growing numbers require remedial help in one or more subjects in order to sustain college-level progress. Particularly in need are those adults who have special problems using the ordinary educational services available to the majority: those confined to institutions, the physically handicapped, those homebound with dependents, and the aged.

To meet the educational needs of these groups for basic functional skills requires the efforts of local adult schools and the State Department of Education as well as those of institutions of higher education. This need must be faced by planners of instructional telecommunications at all levels including postsecondary education because the problem is so pervasive and each segment has different resources and insights to contribute to statewide solutions.

Special Characteristics of Potential Learners

The largest group of adults needing basic skills improvement consists of school dropouts who need motivation to return to learning, personal encouragement to continue, and a non-classroom approach to instruction. They are unlikely to seek out conventional systems of "schooling"; indeed, most of them must be sought out and will be quite dependent on personal help from tutors and instruc-

tors. Many will have communication problems, learning disabilities, difficulties with logical thinking, or personality problems, in which case diagnostic help from professional counselors will be needed.

A second and somewhat different group that is growing rapidly consists of Spanish- and East Asian-speaking newcomers to California who speak English only as a second language, if at all. They may be well motivated to learn English, but unlikely to be able easily to commute to campus and somewhat less likely than other adults to have access to television, FM radios, or telephones.

Relevant Technology

For encouraging these adults to resume learning and for informing them how to proceed, broadcast media can provide the widest outreach. Public radio and television stations can reach 90 percent of the State's population already, and commercial stations can reach even more. The experience of Great Britain's BBC programming in reducing illiteracy by illustrating the advantages of literacy can be applied here.

But while broadcasts can stimulate interest among potential learners and carry some core instruction, they can likely play only a partial role in instructing these adults. Intensive one-to-one personal tutoring by specially trained peers or professionals will be essential for sustained learning. According to the best California study of the problem, this tutoring will not involve classroom attendance but, instead, individualized contacts on or off campus. Taped modules of instruction might supplement tutorials, as might some computer programs, such as those Control Data Corporation is marketing in the "adult basics" area as part of its PLATO system. Perhaps the most crucial instructional use of telecommunications technology for basic skill learners will involve special training for the peer tutors or instructors themselves. To train tutors and teachers, timely expert assistance could be offered through instructional television fixed service (ITFS) systems. These are already operating in several major school districts, and they permit two-way interaction between a master teacher and groups of tutors or instructors at any number of local sites.

Thus, a three-tiered use of electronic communication seems appropriate for field testing in mounting a new approach to this immense social problem: (1) broadcast television (and cable television, where applicable) for motivating, pacing, and (in part) instructing learners; (2) ITFS for inservice training of peer tutors and professional teachers; and (3) modules of instruction recorded on cassettes, videodiscs, or computer programs for individualized instruction and drill.

For adults learning English as a second language, one simple model of telecommunications use is San Diego's "Dial-a-Lesson" approach described in Chapter One. Although the project has not yet been thoroughly evaluated, it would seem well adapted in meeting at least part of the need. The taped telephone messages invite the caller in his or her own language to repeat phrases as did the earlier foreign language records such as "Linguaphone." Obviously the same device could provide information about where to find further help in learning English.

The need to offer remedial English or English as a second language is so pervasive in California, and so many different organizations offer instruction about reading, writing, and speaking English, that programs in these skills would seem to lend themselves to the use of broadcast and cable delivery. For example, some of the common, repetitive elements of instruction now on cassettes in learning centers of public colleges could be made available via cable television to entire communities, together with instructions about how to find further individual help at the nearest center. The general need, in fact, is so broad that there are actually several distinct and definable subgroups of the total target population. This suggests that more than one approach be tried and monitored, in order to refine the most effective efforts for statewide adaptation.

Interested Agencies

Banks, large corporations, the military services, and State agencies that have a direct stake in raising the self-help level of their clients can be asked for staff and facilities support as well as direct financial participation. A wide variety of organizations could play significant roles in a coordinated statewide approach to reducing this public problem.

Already, the California Public Broadcasting Commission and segments of public education in the State have begun exploratory discussions toward cooperatively meeting the need for basic skills training with the help of telecommunications.

UNDERSTANDING OF GOVERNMENT, PUBLIC ISSUES, AND PUBLIC SERVICES

Participatory democracy requires that citizens understand the overall operation of government--federal, State, and local: how it is supposed to work, how it is supported, how the individual can participate effectively in it, and how to make use of its services. Without broad public understanding of these matters, American government becomes less effective and less stable, and all citizens

become less secure. No single indicator can tell how well Americans in general and Californians in particular understand government and its processes, but there is more than one kind of clue. Surveys indicate that one out of every four American 17-year olds does not know that the United States Congress constitutes the legislative branch of the federal government. Less than half of America's 17- to 18-year olds have heard about absentee ballots. Barely half know that each state has two United States senators, that the number of representatives is based on state population, and that the President cannot appoint congressmen. 7/ In the 1976 election, a scant 53 percent of California's adults took part in selecting their national, State, and local leaders. And public discussions of issues such as tax relief reveal widespread confusion among the State's adults over what taxes do and who may levy them. Moreover, such lack of understanding is not confined to the non-college educated.

All these strands of ignorance and misinformation form one whole cloth, contributing to an all-too-common sense of powerlessness and cynicism among the electorate. But they involve at least three types of needed understanding: (1) the structures and processes of government--the American way of handling public problems; (2) facts about public issues; and (3) means of obtaining public services.

Special Characteristics of Potential Learners

One characteristic that surely must affect how education in this category is to be provided: individuals can get along quite well without much understanding about government, although ultimately the city, State and nation could not survive collective ignorance or neglect. Unless one is working toward a diploma or degree, there is little motive to enroll for formal instruction pertaining to the structures and processes of government. This suggests that information and dialogue about government must be presented very widely where people happen to be. They will not flock to learning centers, schools and campuses initially. A similar observation can be made about the presentation of major public issues of the day: although the outcome of an issue may affect everyone, no one but degree candidates can be required to study the issue.

Another characteristic, however, of nearly all potential learners in this field is that they pay taxes--more than one kind of taxes and to more than one level of government. This could supply some of the incentive which was just said to be lacking. Residents of California accumulate a direct financial stake in government as taxpayers and could be addressed in that light to learn more about it.

In the case of educational information about public services, portions of the population are characterized by particular needs. Many elderly people, for instance, lack either information or confidence, or both, to seek the special services intended for them. People whose facility in English is poor may require specialized efforts to inform them about needed public services. The variety of services by government is so great that the best way to characterize the recipients of service is to say that they comprise quite specialized groups and are less likely to be reached effectively by a broadcast medium than by specially focused media.

Relevant Technology

Media coverage for the nation's Bicentennial and for the near-impeaching of a president provide some outlines of popular and vivid styles, as well as the pervasive delivery, needed for widening and deepening adult understanding of government and public issues. The academic levels ranged from elementary to advanced political analysis; the approach, from short vignette to gavel-to-gavel coverage; the content, from simple reportage to scholarly interpretation.

Important moves with telecommunication already are being made in the direction of wider education on public issues and government activities. Sessions of the United States House of Representatives are now televised and made available to networks and cable systems. Several top-rated television programs, such as the McNeil-Lehrer Report, deal analytically with public issues. In California, with funds from the California Public Broadcasting Commission, public television stations have launched a weekly review of happenings in State government which reaches some four million viewers. California Public Radio has established a news center in the State capital. Education Satellite Services in Los Angeles, an alliance of high schools and communications groups, with Walter Cronkite serving as chairman, promises excellent programming for understanding issues at the secondary school level. And cooperative projects between public television and California's higher education institutions, such as the California Policy Seminar of the University of California, are increasing the amount of high-quality material available for electronic distribution.

With minimal additional funds, selections from this accumulating body of issues-oriented material can be made available for further educational use. The broadcast media probably should continue to provide the initial distribution for such material. But after a first or second use, much material in this category goes to waste because it is not "re-packaged" for instructional uses.

Academic departments already offer regular degree-credit campus lecture sections dealing with political structures and processes, as well as issues. Much the same material can be made available in an alternate format beyond campus, both for "credit students" and for general interest "audit" students.

Telecourses can provide quality instruction economically in courses with perennially high enrollment, such as American government and United States history. They should become available on a cyclical basis in every region of the State. Community Colleges and public broadcasters have a tested system for teaching by telecourse in heavily populated regions of the State. Broadcasters worked with regional consortia of Community Colleges to offer a two-semester, college-level telecourse on American government during the past three years. Such a course would seem to provide a natural basis onto which the colleges could splice further instructional modules or develop an entirely separate course to orient Californians to State and local levels of the political structure.

The technological means and much of the content are already available for such modules. They simply have not been joined for benefit of the non-classroom learner. Higher education institutions in California have been able for years to manage large course sections on campus with the help of closed circuit black-and-white TV monitors that have shown mostly "talking head" lectures. Every college dean now knows about the art of balancing the costs of very small enrollment courses by offering perennially large enrollment courses. What is envisioned here could be more attractive than "talking heads" and could also achieve the effect of saving faculty effort for instruction at higher levels or in smaller enrollment courses. Moreover, telecourses about the structure and operation of government at all levels could bring the reality of the political process to thousands of viewers concerned about public issues but previously unmotivated to enroll in courses on them.

Well-made modules of such a series as government structure and process would have uses in scores of different learning situations in addition to the telecourse as broadcast or carried over cable. Public libraries could provide an economical and far-flung network of sites for storing and playing copies of the tapes, either for individuals or groups. The League of California Cities and other civic organizations might make use of them in public information activities. Just as some State parks make admirable use of film and slide shows at the parks to explain significant events or personages in California's history to tourists, and just as the Legislature offers excellent printed material to visitors at the State Capitol about how the Legislature functions and how a bill becomes a law, other offices and agencies of the State could share in creating audio or video modules about their functions. For

instance, the Franchise Tax Board could address taxpayer questions and offer taxpayer instruction, the Department of Aging could describe services for the elderly, and the Department of Motor Vehicles could provide driver information. Together the modules thus produced could form a coordinated series about State and local government; each module could carry the learner beyond a high school understanding of an agency and its role; and each could be available to that agency for its use as well as to libraries and academic institutions. The modular approach would allow any given portion to be updated or replaced whenever it becomes outdated, without affecting the rest of the series. The major point here is that since government itself--its functions and limits--has once again become an issue of great public interest in America, the means to a maturing grasp of government can become, with instructional telecommunications, just as pervasive and almost as interesting as the fleeting news about current events.

Interested Agencies

Beyond colleges and universities, public broadcast stations and cable systems, it is apparent that many organizations, public and private, have a direct stake in better public understanding of government issues and services. Voter information, taxpayer information, commercial and law enforcement information--each function and service that Americans have assigned to their government at some level points to a larger basis of theory, debate and experience which should be grasped by as many citizens as possible in each generation.

EMPLOYMENT INFORMATION AND OCCUPATIONAL SKILLS

Training for gainful employment is a societal need as well as a private individual need. Business and industry in California might be termed "learning intensive"--so dependent are they on change and adaptation. To adjust to change, employees need the means to learn more than one set of skills for their lifetime; changing careers rather than just jobs has become a common occurrence for Californians, partly because of new types of work becoming available. And to maintain the highest possible rate of employment, prospective employers and employees must have an efficient way to exchange information with and about one another. During 1979, when an average of 10,286,000 Californians were employed, some 1,500,000 or 14.5 percent registered with the Employment Development Department for help in finding new employment and in receiving unemployment insurance.

That same year, Gil Paltridge's exploratory study for the Postsecondary Education Commission, "Educational Information and Advisement

Centers in California--Inventory of Existing Organizations," showed hundreds of diverse agencies and institutions in California trying to provide appropriate, individualized information and counsel for people in the process of job transition.

The difficulty in discussing uses of telecommunications to help provide the training for this enormous turnover is that the occupations and programs are so diverse as to defy most generalizations. Countless private firms, as well as some educational institutions, already make wide and, in some cases, intensive use of telecommunications for occupational training. These uses range from computer-assisted instruction (CAI) at the workplace to audio- and videocassette series mailed to the home. Subject levels range from rudimentary to highly technical. Moreover, that part of the adult population implied by this need category--and the jobs they occupy--obviously is extremely varied, from farmers reached by Cooperative Extension via radio to psychiatric nurses enrolled in continuing education. For planning purposes, therefore, it is tempting to conclude that this need will take care of itself and to bypass it quietly. Yet two educational aspects of this need are common to most employers and employees and warrant attention: (1) matching persons and positions (the "employment" process), and (2) continuing to fit the individual's knowledge and abilities to the job (the "in-service training" or "development" function).

Special Characteristics of Potential Learners

Employees and prospective employees are motivated to learn: they want to perform at least well enough to remain competitive in gaining and retaining a job, and perhaps well enough to attain full competence for a career. In addition, the need to adapt to the requirements and peculiarities of a specific work environment--particularly the interpersonal environment--pose problems for even the most able employee.

A second characteristic of members of the work force as learners is their preference to engage in job-related learning at or near the work-site. Time and distance constraints weigh heavily on them. Nationwide surveys show, for example, that large amounts of "education benefits" for employees go unused each year--in part because of the time and travel necessary for taking advantage of them, when formal instruction is not available near at hand.

Relevant Technology

Regarding the employment process of matching persons with positions, State-level efforts are already underway for using the computer to provide employment information to individuals. As noted in Chapter One, EUREKA, the California Career Information System operated by

Contra Costa College, is a computerized body of current occupational and educational information which is specific to the area in which an inquirer lives. This information is stored in EUREKA's computer memory. A client, at any of 120 sites, can present to this system questions about many different careers and the educational paths into them--including admission requirements, costs, support services, and the location of the nearest educational programs. A similar parallel system of computerized information can provide constantly updated facts for "job-matching" just as easily as EUREKA does for occupational and educational program matching.

For in-service training, many Californians can attest that tape cassettes can greatly enhance learning, as can instructional television fixed systems (ITFS) in those areas having such systems. Often ITFS has a two-way interactive capacity, as in the case of the Northeastern California Higher Education Council network involving Chico, Davis, and community colleges in the region, and the one linking some two dozen San Francisco Peninsula firms with Stanford. In high-density population areas, new client locations can be added to ITFS and old ones relocated for relatively low cost. Sometimes extended farther by microwave links, ITFS in California already connects instructors with employee-learners at hospitals, campuses, school districts, businesses, nursing homes, government buildings, libraries and community centers. More can be done of a similar nature.

Interested Agencies

Municipal or regional agencies and regional consortia of colleges and businesses could save much staff travel time and expense if they were to cooperate in making maximal use of ITFS capacity, both present and potential. For example, fire and police personnel can use an ITFS for training during late night and weekend hours, parent and civic groups in the evening, teachers in late afternoon, and school classes during school hours for maximum efficiency.

SOCIAL RESPONSIBILITIES AND INDIVIDUAL DEVELOPMENT

For any society to hold together, its adult members must develop at least some understanding and skills for getting along together and actively cooperating for the "common wealth," both on a small scale--as parents, for example, or as children of aging parents--and on a larger scale as neighbors and citizens. Yet in a culture as mobile as California's, immigration, job transfers, and family rearrangements occur so rapidly that the normal growing-up process cannot be counted on for ensuring that this learning occurs. Perhaps the most common example of this problem occurs in establish-

ing and nurturing a family. Where can an adult Californian acquire dependable knowledge and insight for fulfilling the roles of parent, grandparent, or the grown child of aged parents? Most Californians have not had the luxury of growing up in a three-generation household, nor even in a three-generation neighborhood.

Arguments persist about the proper role of California's public education institutions in teaching about the responsibilities of persons and groups to one another, but there can be little question that public schools and colleges have been intended to furnish students important experiences regarding relations with others--communicating with peers and diverse types of persons. Important blocks of the liberal arts college curriculum are devoted to knowing other peoples, cultures and languages. Yet there remains a continuing societal need for learning more about social interrelationships and roles, both at an interpersonal level and at an intercultural and international level, lest we be wrenched apart along deep and divisive sociological faults. Society thus has a definite stake in encouraging people to fill societal roles better. The parent-child relationship, for instance, has obvious effects on the success of the schools, and the community-child relationship has profound effects on law enforcement.

Beyond education for social responsibility, State government has an interest in protecting the public's health and safety, and in encouraging sound individual development. Especially for able and mature citizens, the primary way for the State to pursue this responsibility is to help people learn how to promote and maintain their own well-being. Such subject areas as physical and mental health, human development, nutrition, and accident prevention education have long been covered in school. In addition, schooling traditionally attends to intellectual and cultural stimulation as an important factor in the quality of public as well as personal life. Yet, substantive weaknesses are common. Thus "physical education" often consists of organized recreation rather than serious learning about the care and cultivation of one's physical self, as in body kinetics and yoga. It is also common for arts and humanities disciplines to be taught more as requirements for graduation than as ways to sharpen one's own thinking, understanding, or sensibilities. Furthermore, cultivating mental health and vitality are not normal aspects of college-level courses in psychology.

Special Characteristics of Potential Learners

Regarding education for social responsibility, adults undergoing major life transitions--becoming parents, facing retirement, searching for a safe neighborhood--represent the chief clientele; older youth, as they begin to assume adult responsibilities, are consciously part of this learner-population. (See the 1979 report of

the President's Commission on Foreign Languages and International Studies, Strength Through Wisdom, 8/ regarding these youth.) This population, even more than the others mentioned thus far, may be so diverse that it cannot be approached in practice as one group at all. Reaching new parents and neighborhood residents probably requires types of media outreach quite different from those used for foreign language and international study.

Potentially the population for social and personal development includes practically everyone. Adults clamor for ways to enhance their physical, intellectual, and cultural well-being. Postsecondary classes in jogging, yoga, exercise, dieting, and cooking fill up quickly year round; public lectures by such thinkers as Bronowski, Galbraith, and Kung have attracted overflow crowds of Californians during the past half decade. Yet there remain large and obvious gaps in the provision of such education. For instance, special problems exist for the poor, the homebound and the confined, who likely suffer most from the lack of these fields of learning.

Relevant Technology

It seems clear that, with an adult public already motivated to pursue learning in this area of social responsibility and personal development, education via the widest possible distribution can help meet this public need best. In many broadcast areas of California, credit courses at the introductory college level have been offered relating to social roles--among them, courses on child development, German language, the history of Mexico, and anthropology. Nutrition information programs on the air are popular. "Lilias Yoga" became a perennial TV favorite in the 1970s. "Civilization," "The Ascent of Man," and "Cosmos" have reviewed the human quest for achievement, knowledge, and beliefs to audiences heretofore not attained and scored notable successes on public television. Such series lead immediately into more advanced studies in established disciplines--the history of art and of science, astronomy, and into philosophy and theology. It is not inevitable but demonstrably possible now for great teachers to reach a popular audience with their intellectual excitement. In that sense, our society has the potential for attaining a new level of personal well-being.

Just as television through Villa Alegre and other programs is introducing non-Spanish speaking children to Latin American culture and language, there is no technical reason why similar introductory courses for adults cannot be broached via popular media, then followed up by cooperative efforts of cable systems through their community educational channels and by colleges and libraries through their cassette repositories and playback facilities. As public broadcast stations continue to diversify their activities beyond broadcasting, and as they interact more with cable systems, it will

become more vital for colleges, universities, and libraries in their area to develop close continuing relationships with both to assure utilization of these technological opportunities.

Cable TV can be used well for alerting people to further resources, such as local groups created for specific purposes, whether for cardio-pulmonary resuscitation ("CPR"), or studies in the literary classics. In addition, it can encourage interaction between and among prospective students: senior citizens in one neighborhood, for example, or parents of children who attend the same school. One use of a school district's ITFS system can be to provide interaction among parents, school administrators, and teachers about parent roles and child development. The California State University and Colleges, through its instructional television consortium (now defunct), mounted one such effort, a statewide course entitled "What Do You Expect?" Viewed both by teachers and parents, it dealt with the self-fulfilling prophecy in the nurture of children.

Another model useful for some kinds of education in this need category is the "Telebrary" use of videotapes developed by Cosumnes River College. It brought elderly people together in small clusters in community centers, church facilities, and libraries and where a convener helped lead discussions after each module of a videotaped program.

Neither instructional television fixed system (ITFS) nor the Telebrary entails a new kind of medium for the State. In order for either to become available statewide, however, some regions would have to create an ITFS network, and some libraries would have to acquire videocassette players and stock the available tapes.

Interested Agencies

In addition to degree-granting colleges and universities, many organizations have a special stake in this broad category of learning. The U.S. Immigration Service and the California Chamber of Commerce, for instance, to say nothing of foreign consulates located in California, have a ready-made interest in promoting better understanding of peoples and systems beyond our borders. City governments and local law enforcement agencies have ongoing, sometimes desperate need for groups and individuals to relate to each other in more informed and rational ways. Many local agencies would cost less if Californians had a better understanding of their roles in domestic relations. Among State agencies having special interest in cooperating with educational institutions and the media are the Commission on Aging and State Departments of Alcohol and Drug Abuse, Consumer Affairs, Food and Agriculture, Health Services, Mental Health, and Motor Vehicles. Finally, private health insurers are taking increasing steps toward active programs of health-maintenance education among their policyholders.

CONTINUING PROFESSIONAL DEVELOPMENT

For reasons of consumer protection, the State requires periodic relicensure and further education for many professionals, such as health care workers, real estate brokers, and clinical psychologists. Even where further education is not required by statute, there is a public gain in encouraging continued education by practitioners of all occupations that serve the public, since continuing improvement of these services is not only highly desirable for the public welfare but essential as our society grows ever more complex. Over a half million adult Californians have specific constraints on them to continue formal education to stay in their profession.

Special Characteristics of Potential Learners

Characteristically, professional persons are strongly motivated for continuing disciplined learning, whether by means of formal classes or through informal sources such as professional periodicals. Through previous education and experience, they have become relatively able and self-directed students. Even under severe time constraints on a daily or weekly basis, they often arrange blocks of time for further education: one-day workshops, all-weekend seminars, intensive month-long courses or research projects. They also tend to be more mobile, with greater means of travel, than the average worker.

Relevant Technology

The simplest of all systems for making use of media technology in continuing professional education is the audiotape. All that is needed is a source of high-quality courseware, a reproduction and distribution center, and playback equipment. Two examples were noted in Chapter One: Continuing Education of the Bar, which produces audiotapes, videotapes, and printed materials on many aspects of current legal developments and distributes them to attorneys throughout California; and the nursing profession, which has a system that, although not centralized to the extent of Continuing Education of the Bar, has numerous modules of instruction including videocassettes for use at home or at the work site. If licensing boards can devise means for appraising a licensee's actual competence for relicensure, rather than relying on course enrollments and the accumulation of Continuing Education Units, this simple learning system obviously can save much time, travel, and costs otherwise associated with classroom attendance. (In nursing, however, California's licensure board presently accepts Continuing Education Units earned on the basis of taped lessons for only a miniscule percentage of the total units it requires for relicensure.)

A second efficient telecommunications model for meeting continuing professional education needs is found in the live interactive transmission of instructional television fixed service (ITFS), as illustrated by its use at Berkeley, Stanford, the University of Southern California, and school districts with staff in multiple locations.

One other model of delivery must not go unmentioned here, for it already is used with some regularity for remote learning: the teleconference. Here professionals can share views and information without the time and expense involved in travel, or confer with specialists unavailable for travel or individual consultation. The University of California, Santa Cruz, and Modesto Junior College have demonstrated such uses of the teleconference by using their linkages with fixed earth satellites to convene meetings across the Pacific on the one hand and across continental United States on the other.

Interested Agencies

Naturally the State licensing and certification boards for the several professions and the professional associations for each of the major professions will have special interest in these kinds of distance learning, as will the Department of Consumer Affairs.

Viewing continuing professional education as a major public need does not imply any judgment that the State should pay for it. Ensuring that a need can be met may be distinguished from paying for it. In this regard, all three of the models mentioned above for meeting this need--tape cassettes, instructional television fixed service (ITFS), and teleconferences--allow sufficient control over their use to make possible the collection of user fees to pay for them.

CONCLUSION

Table 3 summarizes the five societal needs discussed in this chapter, gives examples of them, reviews the characteristics of the potential learners, offers examples of appropriate media and model systems, and notes organizations with special interest in meeting these needs.

By focusing on such social needs as increasing the public's understanding of government and public issues, statewide planning for telecommunications in postsecondary education can avoid mere fascination with the current profusion of available gadgetry and the tendency to use telecommunications technology merely for "add-on" activities to serve the less serious students. When one begins by

TABLE 3: MAJOR SOCIETAL NEEDS FOR EDUCATION

TYPE OF NEED	TYPICAL SUBJECT MATTER	SPECIAL CHARACTERISTICS OF POTENTIAL LEARNERS
Basic adult competencies or survival skills	Read, write, and speak English (often as a second language); understand one's rights and responsibilities; use arithmetic for personal finances; etc.	Not school oriented; need to be found and encouraged. Tend to be dependent learners, needing personal instruction. English-as-a-second-language students may be well motivated but not mobile
Understanding of government, public issues, and public services	Structure and operation of American government at federal, state, and local levels; timely issues such as energy conservation; sources of available help	Diverse levels of formal education; unlikely to be highly motivated except possibly as taxpayers or regarding some particular concern
Employment information and occupational skills	Job and career information and related training opportunities; employment strategies; on-the-job training	Likely to be well-motivated for employment and advancement; restricted by time and distance constraints
Social responsibilities and individual development	Parenthood; intercultural understanding; knowledge of other peoples and languages; information about human development, nutrition, health and safety, physical and mental well-being; humanities	Virtually the entire adult population, but problems of access confront the poor, elderly, and confined. Problem-oriented or issue-oriented, rather than academic-discipline oriented. Likely to favor interactive learning process.
Continuing professional development	Updated information, inservice development, relicensure requirements	Well-motivated independent learners; time constrained but mobile

APPROPRIATE MEDIA	CURRENT EXAMPLES	ORGANIZATIONS WITH NEED TO PROVIDE EDUCATION OR INFORMATION IN THIS AREA
Broadcast radio and television for motivation; cassettes for some instruction; instructional television fixed service (ITFS) for training tutors and teachers	Dial-a-Lesson in San Diego; current proposal by California Public Broadcast Commission with educational institutions to develop cooperative plan	Employment Development Department, Department of Corrections, county welfare departments, employers, banks and other lending institutions
Broadcast radio and television, community service channels on cable television, cassettes, telephone Watts line to computer bank regarding services	Community college telecourses, Telebrary, public broadcast capital news office in Sacramento, Cooperative Extension telephone recordings	Secretary of State, Consumer Affairs Department, Franchise Tax Board, Commission on Aging, Legislature, county and city governments
Computerized information and guidance, Teletext, instructional television fixed service (ITFS) for inservice education	EUREKA (California Career Information System), educational information centers, Northeastern California Higher Education Council ITFS system	Business and industry, Employment Development Department
Broadcast radio and television, community service channels on cable television, cassettes, instructional television fixed service (ITFS) linking community agencies and learning centers	Community college telecourses, Telebrary, television series such as "Ascent of Man" and "Lilias Yoga," California State University and Colleges series on "What Do You Expect?"	Departments of Health Services, Consumer Affairs, Food and Agriculture; local law enforcement and public health agencies; employers; food stores; civic organizations; foreign consulates
Cassettes, instructional television fixed service (ITFS), teleconference	Continuing Education of the Bar cassettes, modular instruction project for nurses, Picturephone Meeting Service of AT&T, Association for Continuing Education ITFS model	Department of Consumer Affairs, professional associations

thinking about major public needs and then asks how telecommunications can help educational institutions deal with these practical learning tasks, then more definite outlines for planning and priorities start to emerge. Each medium, whether electronic or not, has its own peculiar strengths which can then be considered in determining how to plan for specific educational tasks. For example, videotape preserves visual closeups such as a surgical technique or the opening of a rare alpine flower. It also lends itself to mastery learning by endless repetition. But, on the other hand, it does not facilitate immediate teacher-student interaction or by itself offer individual encouragement to the learner. Deciding on priority needs and knowing the special characteristics of adults with these needs are required for making practical and efficient choices among the diverse media available for statewide use. None of these media is exotic or foreign to the California experience. Each is readily applicable on a statewide basis to one or another of these needs.

3 LIKELY PROBLEMS AND NEEDED ACTION

During the past decade, several initial problems regarding the use of telecommunications in postsecondary education proved solvable:

- The quality and quantity of such instructional materials as videotaped programs and interactive computer programs increased significantly. (Appendix D contains an annotated list of major catalogues of presently available software.)

- The number of educators experienced in the technical skills needed for producing or using such approaches greatly increased as scholars and teachers, particularly in the professional schools, found additional uses for telecommunications in their research, consultation, and teaching.

- Institutions improved their student support services for telecourses, resulting in increasingly high rates of course completion by enrollees. Many institutions learned to make effective use of the "learning center" and "learning carrel."

- The cost per student decreased markedly for instruction with telecommunications as more and more institutions began to collaborate in consortia for producing and using electronic programming.

- Educators have gained experience with the intricacies of copyrights and residual payments regarding telecommunications, so these problems are no longer the prohibitive barrier they once were.

Other problems, however, remain. This chapter analyzes three of the most serious: (1) lack of incentives for using technology in teaching; (2) high initial costs of some mediated instruction; and (3) lack of coordination among interested institutions and agencies.

LACK OF INCENTIVES

The one factor most often mentioned as a deterrent to using telecommunications for teaching is negative attitudes on the part of faculty members and administrators. The reality behind this conclusion is more complex, however, than mere negativism or the often-claimed "tradition-bound" nature of higher education. True, academics, just as other people, resist changing their accustomed ways of working without good reason; and some professors may still believe that there are inevitable losses of educational quality as one

moves from teaching that makes little use of technology to instruction that relies on it. But throughout the centuries, educators have created and adopted new technology to improve their teaching and intensify what they can bring to their students. The printed text enabled professors to make more efficient use of the limited time they could spend with individual students; the laboratory workbench and the operating amphitheater allowed students first-hand observation of actual experiments and surgical techniques; and now electronic communications can bridge most constraints of time and distance.

Today, instructors and counselors may still have little information about how telecommunication can relate to their work in a positive way, and administrators may imagine the time and money involved in using telecommunication outweigh its advantages, believing that all telecommunication but the telephone is prohibitively expensive for instructional use.

In any bureaucracy, a novel proposal creates anxiety, and anxiety promotes avoidance or inertia. So the lack of any perceived benefit or incentive from employing telecommunication technology often leads both to half-hearted administrative backing and to faculty inaction:

- Few academic departments, for instance, give as much weight toward faculty advancement for collaborating on a new telecourse or videotaped learning module as they do for co-authoring a textbook or an article.

- Department chairpersons sometimes have the impression that if they were to implement more efficient ways of teaching, their departmental budgets would be cut, since economy seems more important to their institution than improved effectiveness.

- Faculty members commonly receive special time off for preparing a <u>new</u> course, but they less frequently get time off to develop a new approach to an existing course--and telecommunication approaches often require extra time to prepare and unaccustomed collaboration with staff of other units, institutions, and organizations.

Thus appropriate incentives, both professional and financial, should be provided to facilitate wider use of technology in teaching. At the institutional level, this will mean changes in institutional priorities and practices to encourage faculty members in developing other approaches to helping students learn. At the State level, changes in funding patterns and administrative regulations can help. For example, in the University of California and the California State University and Colleges, the extension and

continuing education divisions tend to be the largest users of telecommunication because of their capacity to charge full user fees for instruction; for regular academic departments, the initial costs in staff time and resources seem to outweigh the benefits for those campuses that are not part of a larger system or consortium. To the Community Colleges, Chapter 1055, Section 84500 ff. of the Education Code allows State support for mediated courses only for those courses that bear academic credit transferable to a bachelor's degree program. This restricts the range of telecourses, unlike other courses, to those carrying baccalaureate degree credit. Moreover, regulations in the Administrative Code limit to 125 the number of students who can be assigned to any one instructor for "independent study" courses (which include carefully paced and supervised telecourses and all other mediated programs or sequences). This number derives from the practical limitations of instructors who must travel to student work sites in supervised "co-op education" programs; but it has no rational relation to the experience of instructors of record assigned to telecourses or programmed studies, who have given adequate individual attention to many more than 200 enrollees. This need not involve a question of an instructor working longer or harder; it has typically involved a different deployment of time and skill.

Telecommunications clearly have the capacity of helping educators teach more students more effectively at lower costs. Thus institutions and State government should remove existing disincentives that restrict the effective use of technology for regular postsecondary curricular instruction.

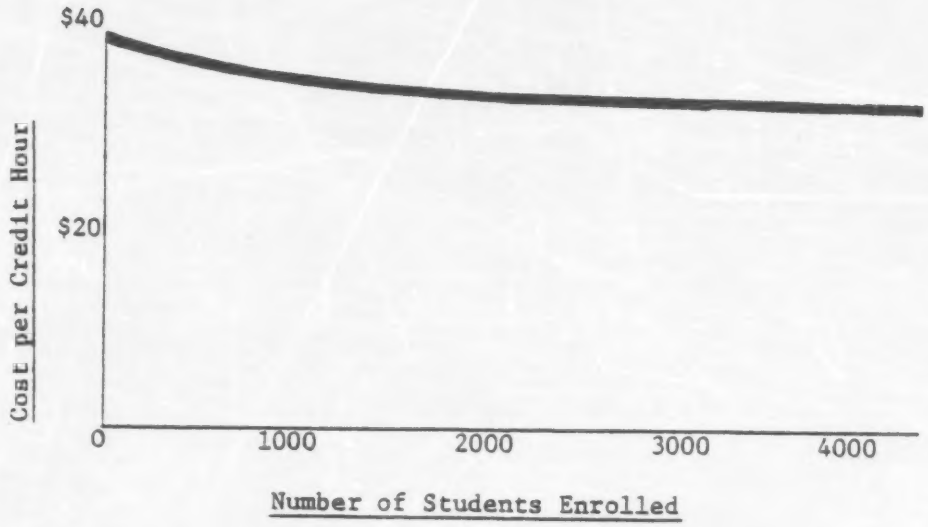
HIGH INITIAL COSTS

In using telecommunication media for instruction--particularly those types involving recorded presentations--more of the cost occurs "up front" prior to offering the course or program than when the students begin to gather for the course. Collaboration with other institutions has diminished this barrier, but these preparation costs, both in terms of faculty time and learning materials, continue to pose constraints. Some different procedure for financial support than from after-the-fact user fees or State reimbursement for student enrollment will be needed to stimulate investment in such preparation. For instance, some proxy measure of outcomes such as course completion might be included in the reimbursement formula. This would allow educators to use whatever modes best attain desired outcomes, rather than merely counting enrollments. (Pp. 32-35 and 43-47 of the Commission's 1979 report, Using Instructional Media Beyond Campus, contains further discussion of this problem. 9/) In addition, future cost/benefit analyses of mediated instruction should take into account the indirect costs and benefits involved as well as direct costs.

The evidence to date indicates that investment in these preparation costs pays off as enrollments recur over time and multiply among institutions. Comparing the direct costs of instruction between classroom-based and mediated or "distant" learning, the mediated approach shows considerable advantages. For instance, as Figure 1 below illustrates, the unit costs or cost per student enrolled in the typical classroom-based course drop very slowly with increases in enrollment. That is, the 150th enrollee adds approximately the same expense as the 15th.

FIGURE 1

Typical Pattern of Cost per Student Enrolled in Classroom-Intensive Courses



Source: Adapted from Dale M. Heckman, "Costs of Instructional Television Statewide, With Two Illustrations: A Working Paper for Discussion by College Practitioners," unpublished report, 1976, p. 70. Colleges analyzed were participants in large consortia.

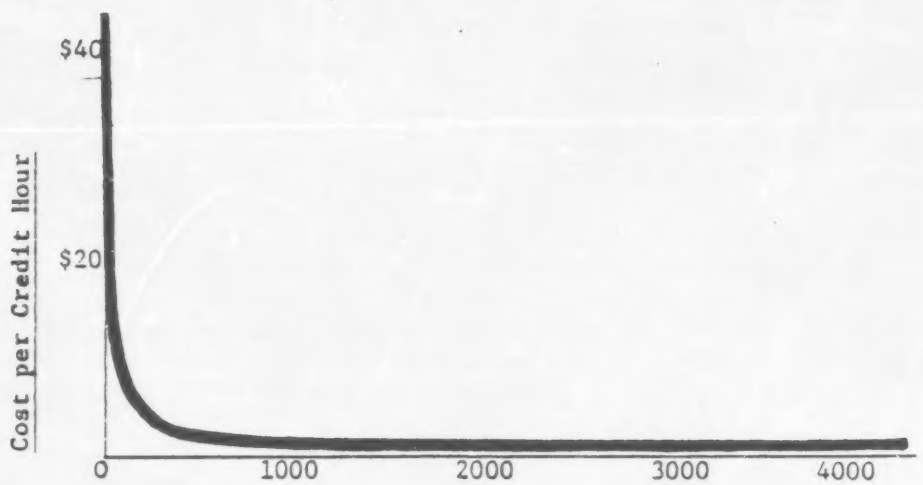
In contrast, once the initial preparation has been made for offering a technology-intensive course by telecommunications to distant learners, the cost per enrolled student declines abruptly, as Figure 2 illustrates.

Robert McCabe describes the differences this way in writing about telecourses versus traditional classroom-intensive instruction in Using Mass Media for Learning:

> While the fixed costs for the academic program are higher for television-centered learning, the incremental cost of instruction is lower. The high fixed cost and low incremental costs form a declining cost curve which begins

FIGURE 2

Typical Pattern of Cost per Student Enrolled in Technology-Intensive Telecourses



Source: Ibid., p. 72.

> above traditional instruction, and crosses below at a predictable level of enrollment, depending on the individual institution, the course, and the instructional services provided. There are many expenditures that must be incurred to enroll the first student. From that point on, the cost for each additional student should be considerably less than for a student in a traditional format.
>
> One additional consideration in television-centered learning is that institutional overhead per student is less. 10/

The economies made possible by technology-intensive instruction such as McCabe describes are largely "economies of scale" in that course materials can be used not only for large aggregate enrollments by more than one institution at a time but also repeatedly over time. In this regard, electronically recorded course materials increasingly follow a modular design with the result that they rather readily can be brought up to date, adapted for higher or lower academic level, and used in different combinations for special emphases. For cost estimating, this means it is important to project and compare costs of various approaches over more than the first year's use, and perhaps through three or even four years.

Costs of production or acquisition and distribution for the more expensive kinds of software are commonly shared among institutions and sometimes over several years. Technology-intensive instruction rarely is the product of one professor, one department, or one institution; and this fact warrants consideration in analyzing its high initial costs.

Beyond these direct costs, the evidence from indirect costs also supports the use of technology in teaching. Consider these factors:

More Effective Use of Faculty

By far the most precious asset of a college or university is the expertise of its faculty. It is hard to disagree with the economists Howard Bowen and Gordon Douglass in Efficiency in Liberal Education that "professional labor is the primary input into higher education's processes of production" 11/, even though their economic terminology sounds more industrial than educational. And whatever enhances the efficient use of faculty expertise in teaching also enhances the immense, long-term investment of institutions in faculty.

In 1912, Edward L. Thorndike argued that "a human being should not be wasted in doing what forty sheets of paper or two phonographs can do. Just because personal teaching is precious and can do what

books and apparatus cannot, it should be saved for its peculiar work." 12/ Telecommunications technology enables faculty to shift their effort from repetitive labor to interaction with students that makes more constant use of their expertise and interest.

For instance, at the University of California, Irvine, Professor Alfred Bork has designed computer-assisted instruction (CAI) for a basic physics course so that the computer responds to the student at a pace more or less set by the student and repeats instruction as often as the student requires to master it. At any time during the course, an instructor can check to see which students are using which programs, how much time they are spending on them, and how well they are progressing; and when the instructor contacts students, he or she has enough information about their progress to provide help tailored precisely to each student's needs.

Similarly, a 1976 study of Community College telecourses in California reported that at one college, an expert in professional writing videotaped her sequence of class presentations, refining them in the process and making greater-than-usual use of graphic imagery, in contrast to verbal examples. Not having to deliver those lectures in subsequent semesters, she found that she could give time and individual attention to the draft manuscripts of more than 150 student writers per class. This was more than three times the number of students who previously could receive such attention in a lecture-discussion section. 13/

Chicago's old TV College provided another example of the indirect benefits of teaching by telecommunication. According to Zigerell and Chausow, during the 1970s, some 6,000 individuals accounted for about 9,000 course registrations annually in the College's telecourses; but surveys indicated that programs for each of these courses were also seen by some 250,000 "casual" viewers who either watched several programs or the entire course. 14/ Only by including some estimate of the benefits of these programs to these thousands of viewers in the "outer audience" could one compare the total cost/benefits of Chicago's televised courses.

Greater Student Success

Technology can also make possible greater student success in learning. As the Carnegie Commission on Higher Education stated, "Much of the new technology is infinitely tolerant and infinitely patient toward the slow learner." 15/ By handling much of the drill and information chores, technology permits instructors to devote significant one-to-one attention to individual learners and thus make significant gains in their rate of course completion. Already, some California Community Colleges are finding that more students who enroll in their telecourses are completing these courses,

compared to the rate of those who enroll in classroom-based courses. Apparently this trend is occurring largely because of faculty attention to each of the students. This reduction in "wastage," as English and Scottish educators aptly call it, should be taken into account in cost analyses, since the number of students completing a course is a better proxy measure of student learning than the number of students simply enrolling in it.

Savings for Students

Analyses of comparative costs of instruction should increasingly consider students' time and expenses as economic resources, as Bowen and Douglass did in Efficiency in Liberal Education. One reason the business world is turning to technology for instruction lies in its efficient use of employee time. Dranov and others have estimated from a large survey sample that in 1980, some 16,500 corporations and nonmilitary government agencies were using non-broadcast video, over 90 percent of them for personnel training. 16/ For some time, advocates of telecommunication have been urging all of us to "move information, not people," and "communicate, not commute." In higher education, the costs of students' commuting time should be taken into account more commonly as the median age of students increases and as more and more students travel back and forth between work, campus, and home.

In addition to student time, student out-of-pocket expenditures should be considered. Many college campuses in California were planned on the assumption that students would commute via private automobiles; but some students lack cars, and for them, access to alternate "capital equipment" such as television, radio, or tape equipment may be less expensive than cars or bus fare. Economies can be attained both for students and for society through energy savings by less travel to campuses. For instance, a typical evening college student enrolled in a course taught largely by telecommunications might save twenty or more trips to campus during a semester or sixty during two semesters and a summer session. If each round trip were ten miles, and an average of only 400 students at each of sixty colleges avoided this commuting, over ten million auto miles would be saved each year. Applying these figures to all the telecourses offered by California's Community Colleges would result in savings of some twenty million miles. And since these twenty million miles represent short-distance driving, it is reasonable to estimate that the fuel saved would be around two million gallons a year.

For cost estimates and comparisons, of course, these savings are those of students rather than direct cost savings to the colleges, the State, or any other public fund. On the other hand, the fuel is an irreplaceable energy source--a common legacy; and State

policy is clearly in favor of conserving it. Fair and adequate account should thus be taken of this saving when weighing the costs of teaching with electronic technology.

Greater Flexibility

Telecommunication not only allows educators to serve more students with a fixed amount of funds, it allows them greater flexibility with the same number of students--for instance, by using several large courses to balance very small enrollments in other vital but specialized courses. It permits students to enroll who cannot travel to campus or conform to a prescribed schedule of offerings, and it allows learners a wider range of approaches to learning: greater autonomy, for instance, or peer group interaction in local neighborhood or workgroup clusters. Thus, while on-campus residential life may be ideal for truly full-time students who attend college immediately after high school, for those older learners whose primary attention is devoted to job or family, the option of more independent and remote modes of learning can be a positive gain.

Optimal Use of Capital Resources

Finally, California has already invested many capital resources not only in campus facilities but in electronic systems for communication. California's twelve public television stations, for example, are estimated very conservatively to have a plant value of at least $250 million. 17/ Add to them the current value of twenty public radio stations, forty-one instruction television fixed service systems, the State's Public Safety Microwave System, the Northeastern California Higher Education Council network, and a score or more of college and university production centers, and, in the words of the Carnegie Commission, "prudence dictates making an early effort . . . to capitalize on the investments we have already made." 18/ In California, the preponderant investment in public ways of telecommunicating has already been made. Now, relatively slight incremental costs can yield large incremental gains.

For example, one of the simplest forms of making televised information available to everyone in California on their own schedule is via videotape for playback in public libraries. It would cost less than $300,000 to provide videocassette playback units in 300 libraries and major branches. (One such playback unit costs about the same as a finished space for one auto in a college parking lot!) It will cost California State University-Chico only $37,200 in new equipment to extend the range of its live interactive instructional television services from the Quincy area across the entire width of Plumas National Forest to the Susanville area, making university-level instruction regularly available to people at Portola, the Sierra Army Depot, and the Susanville Prison.

The broadcast stations and the campus studios already exist. The public capital expenditure has already been made. Additional use of any of these resources for postsecondary education need only be calculated as incremental costs, just as "per student costs" for classroom teaching commonly do not include a factor reflecting the original costs of the campus and the classroom itself.

LACK OF COORDINATION

Organizational differences continue to hamper the use of telecommunications for postsecondary education. Coordination within each of the several segments of California postsecondary education is far more extensive than among segments. For example:

- Within the University of California, during 1980, a systemwide task force studied the feasibility of linking all nine University campuses for administrative telecommunication; and this year a task force is surveying the academic or instructional needs of each of the campuses in preparation for designing a telecommunications network which could serve both administrative and academic functions.

- The California State University and Colleges has already completed an engineering study for connecting all nineteen campuses and the Chancellor's Office building via microwave and instructional television fixed service (ITFS) for both administrative and instructional purposes. It has requested federal funds to complete that portion of this network from Chico as far south as the Bakersfield campus.

- California's 106 Community Colleges are organized into five regional consortia to offer and create telecourses. The five serve the San Diego, Los Angeles, Fresno, San Francisco, and Sacramento regions, and have the potential for coordinating other instructional technologies besides television.

- California's 168 public libraries and nearly 3,000 service outlets, its fifty-eight county law libraries, eighty State agency libraries, 170 academic libraries, and some 500 special libraries are increasingly linked to one another and to common data bases by electronics supported by the California Library Services Act.

Yet apart from the exemplary initiative of the Northeastern California Higher Education Council, and an invitation on the part of the Office of the Chancellor for the California State University and Colleges for other institutions to take part in its planning of its microwave-ITFS network, coordination among segments has been negligible. The California Public Broadcasting Commission has stated:

> While each of these groups has a genuine need for interconnection, the planning and in some cases the implementation of the individual systems have been accomplished without consideration for the needs of other groups and the potential for shared use. Unfortunately, there has been little or no communication among the various groups in the planning of systems. 19/

In some instances, opportunities for cooperation have been lost when institutions that have expressed interest in sharing new communication systems have not all been interested at the same time.

The Legislature has directed the public segments of postsecondary education to report to it this year on their planned use of television for carrying out their assigned missions. But because statewide coordination of telecommunications for learning involves a wide variety of participants beyond educational institutions and libraries--including broadcast stations, cable companies, and State agencies--special efforts at coordination are needed. State government neither owns nor controls a large part of the system for public telecommunication in California. Indeed, the "system" is more akin to a maze of trails, byways, roads, and freeways weaving across the state. There is public access to nearly all of it; but cooperation is needed to link the resources in one region or all the major learning sites statewide into a network of telecommunications.

It seems advantageous, in fact, that these different centers of initiative exist. The pluralism of local broadcasters, educators, private entrepreneurs, and community franchisers reduces the chances of domination of statewide distribution by any single agency or association. Nonetheless, to use the available technology to meet public educational needs statewide will require broad agreement among these groups and leadership by some State-level catalyst.

This year the California Public Broadcasting Commission applied to the Legislature for funds for a thorough technical study of the most advantageous ways to interconnect telecommunication centers and educational institutions statewide. This study makes considerable sense, not only to enable public broadcasting stations to develop multiple routes for receiving and transmitting programs but to ensure that higher education institutions share these routes for distributing instruction throughout the state.

In addition, we support, in principle, the completion of public telecommunication networks that will ensure to postsecondary education institutions and libraries the ability to distribute instruction and information widely. Thus we recommend that the State give

priority in funding public telecommunication linkages to those that involve more than one segment or level of educational institution, in order to promote their optimal use and educational outreach among Californians.

For catalytic leadership in meeting important educational needs on a statewide basis with telecommunications, some new entity is required. The California Public Broadcasting Commission has an Instructional Broadcast Advisory Committee, but despite this committee's able membership and considerable efforts, it has no delegated authority on behalf of the educational community, no mandate beyond public broadcasting, and almost no influence over funds. The California Postsecondary Education Commission, meanwhile, has broad interests in all facets of postsecondary education but has no authority to initiate formal educational programs. It has a policy, moreover, of not administering instructional projects.

What seems necessary is an interagency and intersegmental council to bring together experts from educational institutions at both the school and college levels as well as from libraries, the media, and other public and private groups involved in educational telecommunications. Among its activities, this council could:

- pinpoint special educational problems and coordinate statewide attacks on them;
- suggest and initiate cooperative statewide efforts, such as compatible data transmission networks;
- encourage development of specific software and help secure funds for its production and use; and
- achieve a cooperative division of labor among involved institutions and agencies while avoiding duplication of effort.

Rather than competing with local groups or existing networks, this council would seek ways by which successful cooperation in one locality or region can be emulated and sustained throughout the state. Rather than becoming an instructional production and distribution center, it would attract disparate organizations into a public cause and help them produce and distribute the needed materials. Rather than becoming a separate new agency or bureau with its own staff and budget, it could provide all the additional leadership needed for fashioning new combinations of learning resources largely out of existing agency and institution staffs and budgets. Therefore, we recommend that the Public Broadcasting Commission and the State Department of Education join with the Postsecondary Education Commission in designing a mechanism to assure ongoing interagency and intersegmental consultation and policy development for educa-

tional telecommunications. One possible mechanism to be considered is a council with membership representative of the agencies and segments involved in educational telecommunication. The design phase should be completed and reported no later than February 1982.

CONCLUSION

In summary, this report has shown that Californians can communicate with one another over time and distance in more ways now than ever before. California has substantial telecommunication capabilities that are under public control, and the technical means are now available to share information and instruction with far less travel and faculty repetitive effort. No technological reason prevents a more statewide use of these means for both formal and informal learning.

At the same time, California has identifiable unfilled needs for education beyond compulsory schooling that warrant attention, not simply to aid individual citizens but to serve the general welfare. Telecommunications can help educators meet these needs effectively. Not only have experiences of the past decade confirmed the utility and efficiency of technology for instruction; in some cases, important public needs cannot, as a practical matter, be addressed statewide without some use of telecommunications.

Thoughtful people are rightly concerned about the potential misuse of telecommunications in education. Nearly always, their fears have to do with "horror stories" about commercial television. Subliminal suggestion by advertisers, one-way communication to an increasingly passive audience, and cumulative bias toward a single world-view are not negligible dangers in a democracy, even with an alert and critical public. These concerns remind us that every form of technology brings with it some form of potential abuse. The telephone introduces possibilities for wiretapping, as well as rude intrusions into our face-to-face conversations. Even such benign media as the closed classroom and the hardcover book lend themselves to distortions of authority, truth, and human relationships. Some former students even have memories of badly used television and other audio-visual aids in huge lecture halls on campus. Against all such abuses, the first line of defense remains the screening processes by which faculty members and other professionals are selected for positions of trust in the teaching-learning process.

To the extent that non-academic organizations assume more and more functions of instructional communication--by default or otherwise--this traditional protection of faculty selection may no longer suffice as a shield against abuse of electronic media. The appropriate response by a society to a new technology, however, has

been for its intelligent members to master the technology, not the other way around. Therefore, the increasing firsthand involvement of regular faculty members in good and appropriate uses of educational technology seems bound to help people discern inappropriate and low-quality uses elsewhere.

A second anxiety arises among college faculty members regarding the impact of telecommunications on higher education itself, since the present revolution in communications can hardly leave higher education unchanged. This report does not envision any demise of face-to-face talk, or campuses--instead, it envisions a new chance for more interaction, not less, between individual students and instructors. And as this report suggests, most institutions already avail themselves of this new opportunity, at least to some extent. Unlike those fabled trainmen who thought their industry was merely railroads rather than transportation, faculty increasingly see their teaching function not merely as lecturing but as helping individuals to learn. There are so many ways of communicating that the current revolution in communications technology ought to lead educators to reflect about combining those ways most fitting for each educational task.

As far as State government is concerned, neither educational institutions nor telecommunication systems are ends in themselves. Both are useful and used to help solve societal problems and meet public needs. By themselves, each is valuable in this process. But combined, their public value multiplies. Based on the progress of telecommunications for learning during the 1970s, the question for California planners and policy makers in the 1980s will be not <u>whether</u> but <u>how</u> to employ this combined resource for the greatest public good.

APPENDICES

A. Summary and Findings of Using Instructional Media Beyond Campus (California Postsecondary Education Commission, 1979)

B. Members of the Telecommunications Planning Advisory Committee

C. Documents Reviewed Regarding Major Societal Needs

D. Catalogs of Taped Instructional Materials for Postsecondary Use

APPENDIX A

SUMMARY AND FINDINGS OF USING INSTRUCTIONAL MEDIA BEYOND CAMPUS

(California Postsecondary Education Commission, 1979)

Formal learning at several different levels above the twelfth grade is occurring in California beyond campus, often beyond classrooms, with the help of electronic instructional media. Surveys have shown overwhelming acceptance by those who utilize these modes of remote instruction. Much of this mediated instruction is demonstrably economical. This is clear and unequivocal. From a statewide perspective, however, mediated instruction is not yet evenly or equitably available to all Californians. There are great differences by geographical region; there also are differences in availability according to the level or type of instructional need. There is well organized outreach of continuing education to the work places of attorneys and physicians, for example, but no media effort to reach adults needing to improve their English reading or writing skills. Yet California has most of the needed hardware and talent with which it could fashion an equitable system of instructional help for those who cannot commute regularly to classrooms.

The chief findings of this study include the following:

1. Largely through the work of consortia of colleges and universities, over 50,000 Californians enroll each year in broadcast telecourses for academic credit; well over 60,000 utilize video-and audio-cassettes for continuing professional education beyond the classroom, including attorneys and registered nurses. Increasingly, other "linkages" are providing people with formal learning opportunities in other-than-classroom modes: Instructional Television Fixed Systems (ITFS) linking the campus with offices, learning centers, hospitals, and homes; newspaper lecture series; and radio broadcasts. While other media also are being explored, these have been used repeatedly over several years by professionals to remain competent and competitive. Furthermore, these newer modes of learning have enrolled additional thousands who would not have enrolled in regular campus classroom courses.

2. Remote mediated learning, combined with appropriate contact with live instructors and peers, can be at least as effective and significantly less costly per unit than traditional classroom lecture modes.

3. With appropriate uses of electronic media and the capacity to use tapes for repetition, "mastery learning" is more readily attainable.

4. Open broadcast is not necessarily the most efficient or effective way to distribute instruction beyond the campus/classroom.

It depends on the nature of the intended audience. When it is used for undergraduates, however, polls indicate that from ten to twenty viewers tune in to the televised part of the course for every individual who enrolls for credit. Instructors and students are overcoming the "isolation" problem.

5. Public Broadcast television stations cannot be looked to for sustained or expanded broadcast of college-level instruction on a statewide basis. Only half the California stations are owned by educational institutions, and the California Public Broadcasting Commission is mandated to help only Public Broadcast stations.

6. Not all regions of California presently have significant amounts of mediated instruction at the undergraduate level. There is great inequity by geographical location in the number and types of courses available by broadcast. In most regions there is little or no postsecondary instruction in Spanish or other foreign languages.

7. There is great variation by academic field in the availability of remote instruction; teachers, engineers, physicians and attorneys presently seem to be chief beneficiaries of media for in-service education. At the college entry level, there are many attractive telecourses,, but none to encourage further effort by those deficient in English and math skills for college. There is almost no remote instruction for those not fluent in English.

8. Since the senior universities and colleges (UC and CSUC) can offer mediated instruction beyond campus only via Extension, they must charge full-cost fees even for upper division courses taught by regular faculty. Community colleges, on the other hand, offer lower division telecourses for no or low fees. This very wide gap in student costs effectively prevents the senior institutions from committing themselves to developing mediated instruction for the upper division curriculum beyond the campus/classroom.

9. Public colleges/universities generally are reimbursed on the basis of enrollments and/or attendance through a portion of the course, not for completing it or mastering its content. There is no economic reward for efficiency. Budget formulae for State support to postsecondary education, on the other hand, could be devised to provide incentives for educators to find the most expeditious ways for students to achieve learning objectives, including the use of various electronic media for those beyond the campus. Such incentives do not now exist.

10. Some experience indicates that appropriate uses of electronic media for instruction--both off-campus and on-campus--can help in cutting the course drop rate. For most part-time students, the relevant unit of accomplishment is not the year or semester but the individual course. Thus, to "increase persistence" now means to increase the completion rate, course by course. More research on this is warranted.

11. One idea which nearly all practitioners in the field of instructional media greet favorably is that of a State-level conference in 1979 to give legislators and faculty leaders a current view of what is attainable in learning with proper uses and combinations of electronic media.

12. With few exceptions, colleges have selected courses for broadcast on a "marketing model" (what will attract the most new viewers to enroll) rather than a "curriculum model" (what sequences or blocks of courses will provide the most help to citizens who cannot commute to campus.) Broadcast offerings thus have an ad hoc character.

13. There is no official process or mechanism for intersegmental, statewide planning, coordinating, developing and using of remote mediated instruction in California. There is much activity of high quality in certain regions of the State; leading practitioners from all segments of education have maintained active liaison through their own informal committee, the California Educational Telecommunications Committee.

14. The three public segments of higher education have much hardware and talent for developing effective and efficient vehicles for enabling Californians to continue their formal education on a part-time basis. It would require relatively small amounts of support, planning, and State-level coordination for them to attain the kinds of economic and learning gains now feasible with electronic learning media.

15. An important first step toward more concerted, statewide use of available media for postsecondary instruction - especially beyond campus - could be taken by the California Postsecondary Education Commission's convening an intersegmental planning task force of experts similar to the membership of the California Educational Telecommunications Committee.

APPENDIX B

MEMBERS OF THE TELECOMMUNICATIONS PLANNING ADVISORY COMMITTEE

November 1979 Appointments

Mrs. Sally Beatty
Director
Southern California Consortium for Community College Television

Mr. Ernest Berg
Specialist
Academic Programs
Chancellor's Office
California Community Colleges

Dr. Martin Chamberlain
Dean
Extension Division
University of California, San Diego

Mr. Hal Enger
San Diego Television College

Ms. Barbara Field
Executive Director
Association of California Public Television Stations

Dr. Allen Hershfield
Assistant Academic Vice President
University of California
Administration

Dr. Kenneth Jones
Chairman
Communications Department
San Diego State University

Dr. David Leveille
Division of Learning Services Development
California State University and Colleges

Dr. Bernard Luskin
President
Coastline Community College

Mrs. Bonnie Oliver
Manager
Educational Technology Unit
California Department of Education

Ms. Carolyn Perkins
California Public Broadcast Commission

Mr. Phillip Rapa
Director
Broadcast Production and Media Services
University of Southern California

Dr. Elinor Richardson
Instructional Broadcast Advisory Committee
California Public Broadcast Commission

Mr. Mason Riegel
Chief
State Communications Division
Department of General Services

Dr. Cy Silver
Chief of Development
California State Library

Mr. Paul Steen
General Manager
KPBS, San Diego

Dr. Peter Vander Haeghen
Director
Learning Systems and Services
Coastline Community College

Dr. George Willey
Executive Director
Bay Area Community College
Television

Mr. Robert Wyman
Academic Dean
American River College

Dr. Dale M. Heckman
Higher Education Specialist
California Postsecondary
Education Commission
(Chairman of the Committee)

Appointed After January 1980

Dr. Carlton Bovell
Assistant Academic
Vice President
University of California
(replaced Dr. Hershfield)

Dr. Michael Kimball
Director
Extended Educational Programs
College of San Mateo

Ms. Kiki Skagen Munshi
University Extension
University of California,
San Diego

Dr. Michael Real
Associate Professor
Telecommunications
Department
San Diego State University
(replaced Dr. Jones)

Ms. Carmela Ruby
Library Consultant
California State Library
(replaced Dr. Silver)

Dr. Mary Walshok
Dean, Extension and Continuing Education
University of California,
San Diego
(replaced Dr. Chamberlain)

Mr. Terry White
Lloyds Bank and Communications
Manager Member, American
Association for Training
and Development

APPENDIX C

DOCUMENTS REVIEWED REGARDING MAJOR SOCIETAL NEEDS

California Postsecondary Education Commission. A Five-Year Plan for Postsecondary Education in California, 1977-82. Sacramento: The Commission, 1977.

California Postsecondary Education Commission. "On the Question of Public Need." Unpublished staff paper. Sacramento: The Commission, 1977.

Carnegie Commission on Higher Education. The Purposes and Performance of Higher Education in the United States. New York: McGraw-Hill, 1973.

Richard E. Clark and David P. Rubin. Instructional Media for Postsecondary Alternatives. Fourth Technical Report, Postsecondary Alternatives Study. Sacramento: California Legislature, 1975.

Commission on the Humanities. The Humanities in American Life: Report of the Rockefeller Commission on the Humanities. Berkeley: University of California Press, 1980.

Constitution of the State of California, Article IX.

Institute for the Future. Priorities in Postsecondary Education. Menlo Park, California: The Institute, 1977.

Instructional Broadcast Committee, California Public Broadcast Commission. Report of the Instructional Broadcast Committee to the California Public Broadcasting Commission. Sacramento: The Commission, 1978.

Joint Committee on the Master Plan for Higher Education. Report of the Joint Committee on the Master Plan for Higher Education. Sacramento: California Legislature, 1973.

National Municipal League. Survey of Seventeen and Eighteen Year Old Americans on General Political Knowledge, by George Gallup, Sr., 1979.

Nomos Institute: California Adult Competency Survey: Final Report. Berkeley: The Institute, 1979.

James A. Perkins and others. Strength Through Wisdom: A Critique of U.S. Capability. Report of the President's Commission on Foreign Language and International Studies. Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, 1979.

Richard E. Peterson, JB Lon Hefferlin, and others. Postsecondary Alternatives to Meet the Needs of California's Adults. Final Report, Postsecondary Alternatives Study. Sacramento: California Legislature, 1975.

APPENDIX D

CATALOGS OF TAPED INSTRUCTIONAL MATERIALS FOR POSTSECONDARY USE

Association for Media-Based Continuing Education for Engineers, Inc. AMCEE Videotape Courses for Engineers, Scientists, and Technical Managers: 1979/1980 Catalog. Atlanta: The Association, 1979.

Some 350 courses in twenty-six disciplines from seventeen universities and institutes of technology are listed and described. Most of the courses are recorded on 3/4-inch videocassette tape. The producing institutions are all well known and accredited. AMCEE has offices at Georgia Institute of Technology, Atlanta, Georgia 30332. Telephone (404) 894-3362.

California Continuing Education of the Bar. CEB Spring Catalog 1981: Books, Supplements, Reporters, Services, Program Booklets, and Tapes. Berkeley: California Continuing Education of the Bar, 1981.

The audiotapes listed in this catalog are for sale, together with printed syllabi that list the subjects discussed and the authorities cited; but the videotapes are not for sale and are only leased for showing to groups of attorneys. Address: 2300 Shattuck Avenue, Berkeley, California 94704. Telephone (415) 642-0223.

Coast Community Colleges. Coast Telecourses. Fountain Valley, California: Coast Community College District, n.d.

This folder lists and describes some eighteen telecourses, including "wraparound" courses in which study materials have been added to an existing television series. All the courses have been used for college credit courses in California and elsewhere. Address of the Coast Community College District is 10231 Slater Avenue, Fountain Valley, California 92708. Telephone (714) 962-8861.

Control Data Education Company. 1980 Catalog PLATO Courses. Minneapolis: Control Data Corporation, 1980.

This 378-page catalog describes some 800 modules and courses, including basic English language skills and also highly advanced topics in twenty-five disciplines, available via computer-assisted instruction (CAI) of the PLATO system. Most of the courses are at the adult and postsecondary level. Control Data Education Company can be reached at P.O. Box 0, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Dallas County Community College District. Instructional Television from Dallas County Community College District. Dallas: The District, 1980.

This catalog by one of the half-dozen major producers of high-quality television instruction in the country contains brief descriptions of ten complete telecourses, including all components and lesson titles, and dozens of single-module 3/4-inch tape cassettes for use in lower division courses. Address: ITV Center, Dallas County Community College District, 12800 Abrams Road, Dallas, Texas 75243.

Georgia Regional Medical Television Network. Circulating Videotape Library of Emorgy University School of Medicine. Atlanta: The Network, n.d.

The catalog of this membership organization briefly describes over 350 3/4-inch tape videocassettes, including the principal medical authorities presented, the appropriate audiences (from physicians to patients), and length in minutes. Many of the older modules listed are in black and white. Address: Georgia Regional Medical Television Network, 69 Butler Street, S.E., Atlanta, Georgia 30303, Telephone (404) 659-5307.

J. Hourigan and others. Modules for Nursing Instruction. San Francisco: Modularization of Instruction in Nursing Project, University of California, San Francisco, 1977.

Both videotapes and audiotapes are listed in this catalog of independent study materials for nurses. The Modularization of Instruction in Nursing Project has been in the Department of Continuing Education in Nursing, School of Nursing, University of California, San Francisco, California 94943. Telephone (415) 592-2049.

B. E. Lauer (ed.). Televised Higher Education: A Catalog of Videocourses. Boulder, Colorado: Associated Western Universities, 1978.

This loose-leaf collection lists videocourses in three general fields: business, engineering, and the sciences. It does not grade or review the courses for quality. Associated Western Universities is at 546 Fourteenth Street, Boulder, Colorado 80302.

B. E. Lauer (ed.). T.H.E. Other Catalog. Boulder, Colorado: Associated Western Universities, 1979.

This second catalog from Associated Western Universities contains listings of videotaped materials in eight areas: agriculture, arts and science, education, health sciences, humanities, law and law enforcement, trades and crafts, and interdisciplinary studies.

Maryland Center for Public Broadcasting. The New Program Catalogue. Owings Mills, Maryland: The Center, n.d.

This catalog includes ten complete course-length series of programs originally produced for broadcast that are now available in cassettes for either broadcast or other use, and describes other programs whose subjects span many academic disciplines but are not regarded as complete courses. The series of programs are not necessarily accompanied by study guides or other print materials.

Massachusetts Institute of Technology. Video Short Courses for Continuing Education, 1981. Cambridge, Mass.: The Institute, 1981.

This catalog describes thirty-five courses in eighteen different technical, engineering, and management fields that include study guides, textbook references, and videotapes of lecture-demonstrations. The video materials include reproductions of all the visuals used in the courses, including chalkboard notes, overhead transparencies, and problem sets and solutions, so no note taking is needed for these pieces of information. Address: Department 99, Room 9-234, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139.

Miami-Dade Community College. Miami-Dade Community College Educational Programs: Print, Video, Audio, and Computer-Based Educational Programs. Miami: The College, 1980.

This folder contains brochures of individual courses (thirteen as of 1980) and includes information on textbooks and other print materials which have been designed as integral parts of each course. Miami-Dade is at 11011 Southwest 104 Street, Miami, Florida 33176. Telephone (305) 596-1211.

National Film Board of Canada. Catalog, U.S. Edition, 1981. New York: The Board, 1981.

This is a list of National Film Board of Canada films that may be purchased in videocassette format and in general are available for use on broadcast television. Most films are single-unit productions, but several instructional series are included. Listings are groups under "Social Sciences,"

"Humanities," and "Sciences" as well as alphabetically, and each film is keyed to indicate its appropriate educational level. Address: National Film Board of Canada, Sixteenth Floor, 1251 Avenue of the Americas, New York, New York 10020. Telephone (212) 586-5131.

University of Mid-America. Catalog '81: Videocassettes and Films for Schools, Colleges, Libraries, and Business. Lincoln, Nebraska, 1981.

College-level and professional subjects in some nine fields are included in this description of videotaped, filmed, and audiotaped courses. The University of Mid-America can be reached in Lincoln, Nebraska 68501 at (402) 474-2300.

FOOTNOTES

1/ Using Instructional Media Beyond Campus. California Postsecondary Education Commission, 1979, p. iii.

2/ Ibid.

3/ Marcia Stewart, "Rate Deregulation, Community Programming, and Cable Television," Report to the California Public Broadcasting Commission, June 1980.

4/ Announcement by Federal Communications Commission, September 9, 1980. See Agenda, California Public Broadcast Commission, December 5, 1980.

5/ Advanced Technology Libraries, August 8, 1979.

6/ California Adult Competency Survey, Final Report. Berkeley: Nomos Institute, March 1979.

7/ These Gallup Poll figures were reported in the Sacramento Bee for January 15, 1979 and summarize a survey cosponsored by the National Municipal League and George Gallup, Sr., in 1978. The findings represent answers from a sample of 1,000 seventeen and eighteen year-old Americans.

8/ James A. Perkins and others, Strength Through Wisdom: A Critique of U.S. Capability. Report of the President's Commission on Foreign Language and International Studies (Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, 1979).

9/ Using Instructional Media Beyond Campus. California Postsecondary Education Commission, 1979.

10/ Robert H. McCabe, "The Economics of Television Centered Courses," in Roger Yarrington (ed.), Using Mass Media for Learning (Washington, D.C.: American Association of Community and Junior Colleges, 1979), pp. 30-31.

11/ Howard K. Bowen and Gordon Douglass, Efficiency in Liberal Education: A Study of Comparative Instructional Costs for Different Ways of Organizing Teaching-Learning in a Liberal Arts College (New York: McGraw-Hill, 1971), p. 23.

12/ As quoted by Sidney Tickton (ed.), To Improve Learning (New York: Bowker, 1970).

13/ Dale M. Heckman, "Costs of Instructional Television Statewide, With Two Illustrations: A Working Paper for Discussion by College Practitioners" (duplicated report). Sacramento, 1976.

14/ James J. Zigerell and Hyman Chausow, Chicago's TV College: A Fifth Report (Chicago: City Colleges of Chicago, 1974).

15/ The Fourth Revolution: Instructional Technology in Higher Education (New York: McGraw-Hill, 1972), pp. 2-3.

16/ Paula Dranov and others, Video in the 80s: Emerging Uses for Television in Business, Education, Medicine, and Government (White Plains, N.Y.: Knowledge Industry Publications, 1980).

17/ California Public Broadcast Commission, Annual Report 1980.

18/ The Fourth Revolution, op. cit., p. 45.

19/ California Public Broadcasting Commission, Planning Grant Application, January 1981, p. 5.

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